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A Field Guide to Site Identification and Interpretation for the Southeast Portion of the Prince George Forest Region

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BRITISH COLUMBIA

Ministry of Forests
Forest Science Program

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C. DeLong

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1 INTRODUCTION

1.1 Objectives/Scope

This guide presents site identification and interpretation information for forest ecosystems of the southeast portion of the Prince George Forest Region (Figure 1.1).

FIGURE 1.1 *Map outlining the area covered by the guide.*

The classification system used follows the biogeoclimatic ecosystem classification (BEC) developed for the province by the B.C. Ministry of Forests (Pojar et al. 1987). The principles have evolved from the work of V.J. Krajina (1965, 1969) and are described in Chapter 2. The objectives of this classification are:

- to provide a framework for organizing ecological information and management experience about ecosystems;
- to promote further understanding of identified ecosystems and the relationships among them;
- to supply resource managers with a common language to describe forest sites; and
- to improve the user's ability to prescribe and monitor treatment regimes on a site-specific (ecosystem) basis.

The guide has two main goals:

- to assist the user in classifying sample sites in the field; and
- to provide interpretations for these site units that will assist the user in preparing management prescriptions.

This version of the guide results from the recent completion of an inter-regional correlation of the BEC system. The correlation project was completed to ensure the consistency and quality of the ecological information base across the province. This guide replaces the *Draft Field Guide Insert for the Identification and Interpretation for the Southeast Portion of the Prince George Forest Region* produced in 1996.

The *Forest Practices Code of BC Act* (brought into force on June 15, 1995) requires that a silviculture prescription (SP) be prepared prior to timber harvesting and prior to activities taking place on areas where timber has been cut, removed, damaged, or destroyed by natural causes or by unauthorized harvest. The attendant Operational Planning Regulation requires that the SP specify the BEC and that it be accompanied by a map that illustrates the BEC. In one form or another, this requirement to describe and map the BEC has been a part of silviculture regulations from 1988 to the present.

The *Silviculture Prescription Guidebook* (B.C. Ministry of Forests 2000) provides recommended "best practices" for, among other things, the description and mapping of BEC. The guidebook states, "The silviculture prescription must contain the following ecological information: biogeoclimatic zone(s), subzone(s), variant(s), and phase(s), where applicable and the site series and (where applicable) phase(s)."

With respect to stratification of site series, the guidebook states, "The BEC site series must be indicated on the silviculture prescription map and described in the silviculture prescription document. Minimum

polygon size on the map will depend on its relevance to management objectives for the site. One hectare is generally accepted as a minimum size." The level of mapping detail will depend on the complexity of management proposed. Whether it is necessary to delineate very small units depends on their impact on the prescription.

1.2 Other Sources of Information

Numerous reports on vegetation, soils, wildlife, and ecosystem description and classification exist for the southeast portion of the Prince George Forest Region and adjoining area. A list of these references can be found in Appendix 1.

A more comprehensive discussion of the BEC system and more complete descriptions of units at broader levels within the hierarchical structure, particularly site associations and site groups, will be available in a series of biogeoclimatic zone reports to be published by the B.C. Ministry of Forests, Research Branch. Information at the biogeoclimatic zone level is available in *Ecosystems of British Columbia* (Meidinger and Pojar [editors] 1991).

An excellent reference for plant identification is *Plants of Northern British Columbia* (MacKinnon et al. [editors] 1992[1]). Page numbers for plants used in site unit identification keys found in each biogeoclimatic unit subsection refer to this publication.

1.3 Guide Contents

This guide consists of five chapters. Following the introduction is a brief discussion of the classification system (Chapter 2). Chapter 3 provides procedures for site description, identification, mapping, and interpretation. Chapters 4–11 contain information about the biogeoclimatic units described, tools for identification of biogeoclimatic and site units, descriptions of the site units, and direct management interpretations for the identified site units. Chapter 12 presents indirect interpretations for silvicultural systems and site preparation options, as well as some basic information on ecosystem management.

Biogeoclimatic unit maps (1:250 000 scale) to be used in conjunction with this guide are available from each Ministry of Forests district office or from the Forest Resources Section, Prince George Forest Region.

[1] Second edition published in 1999.

The classification is based on approximately 1000 plots located in the southeast portion of the Prince George Forest Region and in shared biogeoclimatic units in the Cariboo Forest Region. These plots are generally well distributed geographically (proportional to the size of the biogeoclimatic unit) except in units with difficult access, such as those within the Engelmann Spruce–Subalpine Fir (ESSF) zone. Most site units are characterized by at least five plots, although certain less common sites (i.e., very dry and wet sites) may be characterized by fewer plots.

1.4 Training Courses

It is assumed that the user of this guide is familiar with the basic concepts and methods of site, soil and vegetation evaluation and has completed the training programs offered by the Forest Resources Section. These courses are offered annually in various locations within the forest region. For information about such training courses, please contact the Forest Resources Section, Prince George Forest Region, or the BC Forestry Continuing Studies Network.

2 THE BIOGEOCLIMATIC ECOSYSTEM CLASSIFICATION (BEC) SYSTEM

This section briefly describes the biogeoclimatic classification system. For a more complete description refer to *Ecosystems of British Columbia* (Meidinger and Pojar [editors] 1991) or *Biogeoclimatic Ecosystem Classification in British Columbia* (Pojar *et al.* 1987).

2.1 Classification System

The BEC system is a hierarchical classification scheme that combines three classifications: climatic (or zonal), vegetation, and site. For practical purposes, users need only be concerned with the zonal and site classifications (Figure 2.1). The information presented in this guide will allow the user to apply BEC in the field.

2.2 Zonal (Climatic) Classification

Biogeoclimatic units are the result of zonal (climatic) classification and they represent groups of ecosystems under the influence of the same regional climate. In the hierarchy of climatic units, the biogeoclimatic subzone is the basic unit. Subzones are grouped into zones, and divided into variants.

Data from long- and short-term climate stations have been used to help characterize subzones. Because climate stations are not well distributed within and among subzones, climax vegetation on zonal sites[1] must serve as an indicator of the long-term climate of the area.

Each **biogeoclimatic subzone** has a distinct climax (or near-climax) plant association on zonal sites. These zonal sites have deep, broadly loamy soils and occupy midslope positions with mesic moisture regimes. The zonal climax vegetation is thought to best reflect the regional climatic conditions of the subzone.

Ecosystems within a subzone are influenced by this one type of regional climate. Edaphic (soil) and topographic conditions influence the climax vegetation of sites either drier or wetter than the zonal condition. Thus, subzones have distinctive sequences of related ecosystems ranging from dry to wet sites. For example, in a wet cool subzone of the Sub-Boreal Spruce (SBS) zone, zonal sites are dominated by a hybrid white spruce and subalpine fir canopy with a diverse, well-developed understorey of shrubs and herbs; dry sites are

[1] Zonal sites are sites that best reflect the mesoclimate or regional climate of an area.

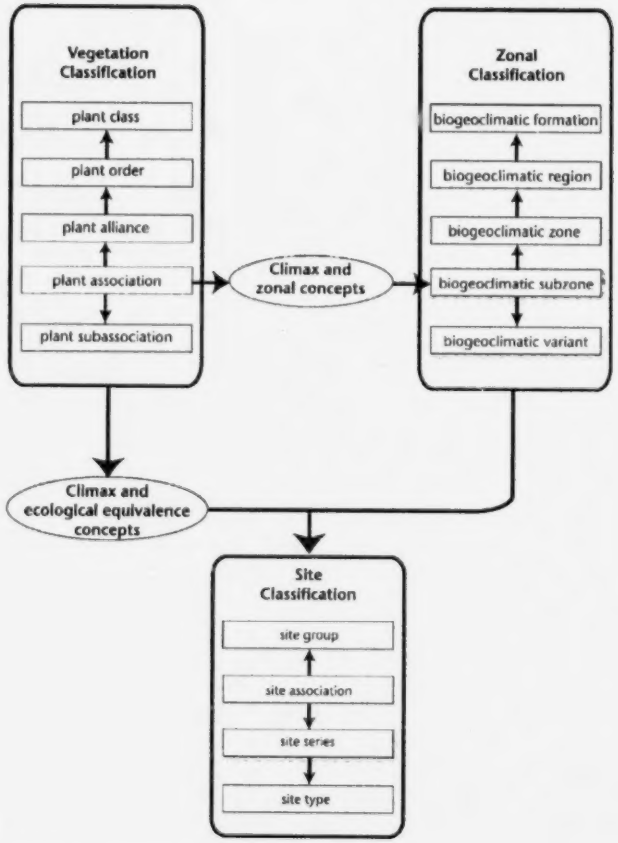


FIGURE 2.1 *Hierarchical relationship between climatic-level (zonal) and site-level classifications (taken from Pojar et al. 1987). The highlighted classifications are described in this guide.*

dominated by a lodgepole pine canopy with an understorey dominated by shrub and moss layers; and wet sites in the same subzone (climate) have hybrid white spruce and subalpine fir overstories with an understorey dominated by devil's club and a variety of herbs (e.g., oak fern, lady fern, horsetails).

The **biogeoclimatic variant** was defined because subzones contain considerable geographic variation. Variants reflect further differences in regional climate and are generally recognized for areas that are slightly drier, wetter, snowier, warmer, or colder than other areas in the subzone. For example, the Horsefly Dry Warm variant (SBSdw1) of the SBS is warmer and wetter than the Blackwater Dry Warm variant (SBSdw2) of the SBS. These climatic differences result in corresponding differences in vegetation, soil, and ecosystem productivity. The differences in vegetation are evident as distinct zonal climax plant subassociations.

Subzones with similar climatic characteristics and zonal ecosystems are grouped into **biogeoclimatic zones**. A zone is a large geographic area with a broadly similar type of climate. A zone has typical patterns of vegetation and associated similarities in nutrient cycling and soil climate. Zones also have one or more typical zonal climax species of tree, shrub, herb, or moss.

Zones are usually named after one or more of the dominant climax species in zonal ecosystems and a geographic or climatic modifier (e.g., Sub-Boreal Spruce zone). Zones are given a two- to four-letter code that corresponds to the name. For example, the Sub-Boreal Spruce zone code is SBS.

Subzone names are derived from classes of relative precipitation and temperature. Subzone codes correspond to the climatic modifiers (Table 2.1). For example, the SBSmw refers to the moist warm (mw) subzone of the Sub-Boreal Spruce (SBS) zone. Variants are named by geographic area and numbered from south to north and from west to east. Hence, the SBSdw1 variant is more southerly than the SBSdw2 variant.

TABLE 2.1 *System of naming and coding interior biogeoclimatic units*

ZONE ab	
a = precipitation regime	b = temperature regime
x = very dry	h = hot
d = dry	w = warm
m = moist	m = mild
w = wet	k = cool
v = very wet	c = cold
	v = very cold

2.3 Site Classification

Site series are the most commonly used units of site classification (Figure 2.1). Site series occur within a biogeoclimatic subzone or variant. They are defined by using late seral or climax vegetation and result in site units having similar environmental properties and vegetation. The potential vegetation and selected environmental properties are used in this guide to characterize site series.

Each biogeoclimatic unit has a characteristic sequence of site series according to soil moisture regime (SMR) and, to a lesser degree, soil nutrient regime (SNR).[2] Soil moisture regime is a relative scale of "available water" for plant growth within the climate of the biogeoclimatic unit. An eight-class scale is used; it ranges from 0 or very xeric (bare rock) to 7 or subhydric (water tables at or near the surface year round). Soil nutrient regime is a relative scale of "available nutrients" for plant growth. A five-class scale ranging from A (very poor) to E (very rich) is used.

English names of one to four species are used to name site series, and tree species codes are usually substituted to shorten the name (e.g., SxwFd – Feathermoss site series).

Similar plant communities can occur in different biogeoclimatic units, but the relative moisture regime that they represent may differ between subzones. These communities belong to the same grouping of site series that is collectively called a site association, such as:[3]

SBSmw/Sxw – Oak fern site series# = SBSmw/06
SBSvk/Sxw – Oak fern site series# = SBSvk/04
SBSwk1/Sxw – Oak fern site series# = SBSwk1/01.

[2] The site identification section (Section 3.4) contains soil moisture and soil nutrient regime identification information.

[3] Site associations are not used in the classification presented in this manual. They are defined in Pojar et al. (1987).

All three of these site series belong to the same site association, so their climax vegetation is similar, but their occurrence in the landscape, site conditions, and seral vegetation patterns may differ among the three biogeoclimatic units.

Each site series is given a two-digit numeric code that relates to its position on the relative moisture and nutrient regime scales. Within a biogeoclimatic unit, the forested units are numbered as follows: the 01 site series is the zonal or mesic site, with the rest ranked from driest (02) to wettest (generally 09 to 12) and, secondarily, poorest to richest. Non-forested wetlands are numbered from 31 to 49, seral site series from 51 to 79 (names of seral units are preceded by a $), and non-forested grasslands are assigned numbers from 81 to 99.

Management interpretations are often made directly at the site series level. In some cases, however, interpretations are most efficiently dealt with at broader or finer levels of the classification, such as those less sensitive to site-level differences (e.g., wildlife) or those affected more by variations in site and soil conditions than by climate or vegetation (e.g., site preparation) (see Section 12).

3 PROCEDURES FOR SITE DESCRIPTION, IDENTIFICATION, MAPPING, AND INTERPRETATION

3.1 Introduction

Ecological site identification consists of collecting accurate site, soil, and vegetation information, and then using the various tools and descriptive material presented in the guide to identify the site unit that best fits the information collected. The development of an appropriate management prescription depends on accurate site description and other site-specific data (e.g., slope gradient, soil texture), as well as correct site unit identification. Combining site identification with the collection of site, soil, and vegetation data provides the most complete ecological description of the site. Figure 3.1 outlines the steps involved and the tools that should be used to describe and identify site units.

The guide user must understand that there is much more natural variability within the ecosystems described than is portrayed in this field guide; thus, not every ecosystem encountered will be easily "pigeonholed" into an existing classification unit. The "cookbook" approach to site identification and interpretation is not encouraged. This field guide is intended to promote ecological thinking and a better understanding of forest ecosystems.

This guide assumes that the user has a basic knowledge of ecosystem classification concepts, soils description, and plant identification. Field courses coordinated by University of Northern British Columbia Continuing Studies are held (depending on demand) in the Prince George Forest Region every summer. Silviculture prescription (SP), stand management prescription (SMP), and silviculture survey courses, all of which have an ecological classification component, are or will be held annually. Regional Forest Resources staff are available to assist with problems associated with field descriptions, identification, and management interpretations. Sections 3.2 and 3.3 provide a complete description of tools for biogeoclimatic and site unit identification. Once on-site information has been gathered, a site can be identified using the step-by-step procedures outlined in the Site Identification section (Section 3.4). Information for identifying seral ecosystems and using the interpretations portions of the guide is discussed in Sections 3.5 and 3.6, respectively.

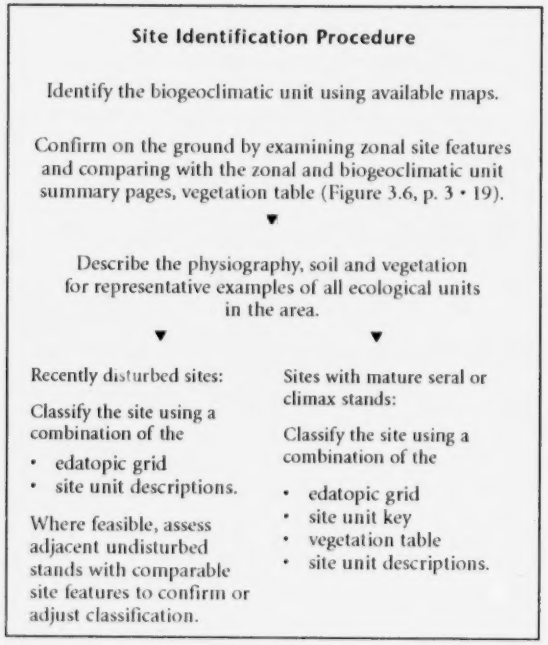

Site Identification Procedure
Identify the biogeoclimatic unit using available maps.
Confirm on the ground by examining zonal site features and comparing with the zonal and biogeoclimatic unit summary pages, vegetation table (Figure 3.6, p. 3 • 19).
Describe the physiography, soil and vegetation for representative examples of all ecological units in the area.
Recently disturbed sites:
Classify the site using a combination of the
• edatopic grid
• site unit descriptions.
Where feasible, assess adjacent undisturbed stands with comparable site features to confirm or adjust classification.
Sites with mature seral or climax stands:
Classify the site using a combination of the
• edatopic grid
• site unit key
• vegetation table
• site unit descriptions.

FIGURE 3.1 *A flowchart outlining the procedure for identifying site units.*

3.2 Identifying Biogeoclimatic Units (Subzone/Variant)

The following is a list of the tools available for assisting the user in identifying and describing biogeoclimatic units.

Biogeoclimatic maps: Available at a scale of 1:250 000 from the regional Forest Resources Section or from district offices, these maps provide a relatively detailed portrayal of geographic distribution of the biogeoclimatic units. This information will also be available in digital format within the inventory database so that it can be accessed in a variety of ways using geographic information system (GIS) capabilities. The biogeoclimatic map should be referred to before leaving the office, but should not be relied on totally, especially if the area is near biogeoclimatic unit boundaries, in complex mountainous terrain, or in areas only recently accessible by ground.

Biogeoclimatic/Vegetation summary table: This table displays important vegetative differences between the biogeoclimatic units described as well as for bordering units not described in the guide. This table compares vegetation that is found on zonal sites (refer to Section 2.2). Once a zonal site has been identified, this table can be used either to identify or to reaffirm the identification of a biogeoclimatic unit.

Biogeoclimatic unit summary page: This page, located at the front of each biogeoclimatic unit subsection, contains a brief summary of geographic location, elevation range, climate, distinguishing vegetation features from other adjoining biogeoclimatic units, soils, forests, and wildlife. The distinguishing features, location, and elevation range information can assist in the identification of a biogeoclimatic unit. The remainder of the information is useful as background material in documents related to the particular biogeoclimatic unit.

3.3 Identifying Site Units

The following is a list of the tools available for assisting the user in identifying site units.

Edatopic grid: The edatopic grid displays how the site series relate to each other along the relative gradients of moisture and nutrient regime. Once relative moisture and nutrient regimes are determined (see Section 3.4), the unit(s) generally associated with that moisture and nutrient regime can be identified from the grid.

Vegetation table: This table indicates the prominence of widespread diagnostic species by site series for each biogeoclimatic unit. Prominence values (PV) are derived by multiplying the square root of the constancy by mean cover. For example, when a species is present in 100% of sample plots (i.e., constancy = 100) and has a mean cover of 5%, the prominence equals 50. Five prominence value classes are displayed by different-sized bars within the tables.

Prominence value	Prominence class	Schematic
0–4	0	
5–15	1	
16–50	2	
51–100	3	
101–200	4	
201+	5	

In general the vegetation tables contain species that are useful in differentiating between different site units. The actual abundance of plant species on any given site depends on several factors, including the successional status of the site and the type and degree of disturbance that initiated succession. The table values are derived from plots in mature forests (80 years or older). These tables should not be used in seral (i.e., early successional) stands that do not have a closed canopy (see Section 3.5). A possible solution is to find a mature stand adjacent to the seral stand, but the user must be fairly certain that this stand represents the same ecological unit as the site being assessed (e.g., same slope position and soil texture).

Site series key: The dichotomous key uses a series of paired statements containing a combination of site, soil, and vegetation features to direct the user to a site series identification. Since the lead statements often refer to the tree canopy and any understorey vegetation comments relate to mature sites, the keys work best on sites that have achieved crown closure. When attempting to use the keys on disturbed sites, the user must have some knowledge of the canopy dominance prior to disturbance and must not rely on the understorey vegetation features described in the key. Alternatively, an adjacent mature stand could be used, though the user must be fairly certain that the stand represents the same ecological unit as the site being assessed (e.g., same slope position and soil texture).

Site series summary page: Each site series has a one-page summary of vegetation, site, and soil features. The vegetation list contains species that are found consistently (high constancy). They are listed in order of constancy, and then in order of percent cover within the same level of constancy. Species in square brackets do not occur consistently, but when they do occur they have high cover. Three plants that generally characterize the unit are illustrated along the left-hand margin. Plant species names generally follow MacKinnon et al. (editors, 1992), which is the manual most commonly used for plant identification in the area. For each site and soil feature, the range in conditions encountered during BEC sampling is indicated. Note that the range indicated may not express the true range of variability that may be encountered. Soil texture classes refer to those displayed on the soil texture triangle in Figure 3.3 (p. 3 • 10). Features preceded by an asterisk (*) are ones that can generally be relied on to differentiate or characterize the site. Distribution is subjectively described in terms of occurrence and size. Occurrence is categorized as very common (dominates landscape, often >50% of area), common (frequently encountered but generally <50% of area), uncommon (not often encountered), or rare (few sites encountered). Size describes the common size of sites from large (often >10 ha) to moderate (often 1–10 ha) to small (generally <1 ha).

3.4 Site Identification

This section outlines a step-by-step procedure to identify a site series. This procedure should be used until users become intimately familiar with the site identification process and the site units in their area of operation.

Step 1
Locate an area for your assessment that appears to be representative of the unit being sampled, and is as homogeneous in plant cover and overstorey canopy condition as possible. Avoid locating the sample area on sites that have recently received significant natural or artificial disturbance (e.g., landings).

Step 2
Determine and record site and soil information important for site identification and the prescription process. Table 3.1 lists some of the more important site and soil factors to be collected. Note that more detailed site and soil information may be required for certain purposes. Tools to assist you include the slope position diagram (Figure 3.2), soil texturing tools (Section 3.4.1), and the humus form description table (Table 3.4, p. 3 • 12).

3.4.1 Hand texturing guides

Soil texture refers to the relative proportions of the sand, silt, and clay separates within a soil. These separates have their own distinctive properties of "feel," allowing one to estimate their proportions in a sample of soil by hand texturing. To obtain accurate results, texturing must be done with a sample that has the correct moisture content as described below. Both a table and a key procedure are provided. The user should become familiar with both methods and use the procedure that feels most comfortable.

TABLE 3.1 *Site and soil factors to be collected*

Factor	Definition
Slope gradient (%):	– measure of a slope's incline; equals vertical rise divided by horizontal distance (100% slope = 45° angle).
Aspect (°):	– the compass direction that a slope is facing.
Mesoslope position:	– relative position of sampling site within a catchment area (e.g., between slope breaks affecting surface water flow; see Figure 3.2).
Soil texture:	– relative proportion of sand, silt, and clay; defined proportions comprising textural classes (see Section 3.4.1).
Coarse fragments (%):	– % by volume of mineral soil fragments >2 mm in diameter.
Effective rooting depth (cm):	– subjective assessment indicating the greatest depth to which root systems of forest trees freely penetrate; depth at which rooting abundance classes drop to "few" (see Province of B.C. 1998).
Depth to a restricting layer (cm):	– depth to a soil layer or condition that severely restricts root penetration (e.g., compact parent material or bedrock).
Depth to seepage water (gleying) (cm):	– depth to area in soil profile from which water is seeping out; evidence of periodic seepage during the growing season may be indicated by gleying (orange-coloured mottles within a generally olive- to blue-coloured soil matrix).
Humus depth (cm):	– depth of group of horizons located at the soil surface that have formed primarily from organic materials, and that may include mineral soil intermixed with organic material.
Humus form:	– the quality of the humus layer classed into three main orders (mor, moder, mull) based on the rate at which decomposition occurs within the layer (Table 3.4, 3 • 12).

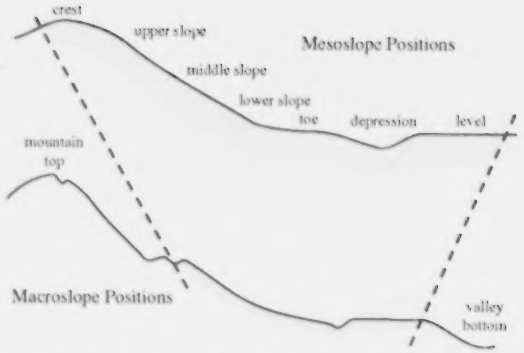


FIGURE 3.2 *Slope position diagram (from Banner et al. 1993).*

Procedure for Hand Texturing Using Table 3.2

1. Crush a small handful of soil in the hand, and remove coarse fragments (particles >2 mm in diameter).
2. Gradually add water to the soil and, with a soil knife or fingers, work it into a moist putty. The correct moisture content is important. If the putty flows with the force of gravity, it is too wet. If it crumbles when rolled, it is too dry. It should have the consistency of filler putty.
3. Determine stickiness of the soil putty by working it between the thumb and forefinger, pressing and then separating the digits. An estimate of clay content (Table 3.3) can be made in this way. (Clay limits below are approximate.)
   non-sticky: Practically no soil material adheres to the thumb and forefinger (<10% clay).
   slightly sticky: Soil material adheres only to one of the digits and comes off the other rather cleanly. The soil does not stretch appreciably when digits are separated (10–25% clay).
   sticky: Soil material adheres to both digits and stretches slightly before breaking when digits are pulled apart (25–40% clay).
   very sticky: Soil putty adheres strongly to both digits and stretches distinctly before breaking (>40% clay).
4. Determine the graininess of the soil putty by rubbing it between thumb and forefinger. An estimate of sand content (Table 3.3) can be made in this way. (Sand limits below are approximate.)
   non-grainy: Little or no graininess can be felt (<20% sand).
   slightly grainy: Some graininess is felt, but non-grainy material (silt and clay) is dominant (20–50% sand).
   grainy: Sand is felt as the dominant material. Some non-grainy material can be felt between sand grains (50–80% sand).
   very grainy: Sand is the only material felt. Little or no non-grainy material is present (>80% sand).
5. After stickiness and graininess have been determined, use the hand texturing guide (Table 3.2) as an approximate guide to the textural class of the soil. The textural triangle found with Figure 3.3 can be used for more accurately determining the textural class; it also displays the textural class used in the site unit descriptions.

TABLE 3.2 *Hand texturing guide*[a]

	Non-grainy (<20% sand)	Slightly grainy (20–50% sand)	Grainy (50–80% sand)	Very grainy (>80% sand)
Very sticky (>40% clay)	Silty clay	Clay	Sandy clay	–
Sticky (25–40% clay)	Silty clay Loam	Clay loam	Sandy clay Loam	–
Slightly sticky (10–25% clay)	Silt loam or Silt	Loam[b]	Sandy loam	–
Non-sticky (<10% clay)	–	–	–	Loamy sand or sand

[a] Sand and clay limits are approximate.
[b] A loam is a textural class exhibiting physical properties intermediate between those of sand, silt, and clay.

TABLE 3.3 *Properties of soil separates*

	Properties of fine fraction
Clay:	– very hard when dry; feels smooth and is very sticky when wet; feels smooth when placed between teeth.
Silt:	– slightly hard to soft when dry; powder is floury when dry; feels slippery and slightly sticky when wet; silt cannot be felt as grains between thumb and forefinger, but can be felt as a fine graininess when placed between teeth.
Sand:	– loose grains when dry; very grainy when felt between thumb and forefinger; non-sticky when wet.

Procedure for Using Key for Hand Texturing

The field tests (outlined below and used in sequence with the accompanying key) are provided as another means to assist in the field determination of soil texture.

1. **Organic matter test:** Well-decomposed organic matter (humus) imparts silt-like properties to the soil. It feels floury when dry and slippery or spongy when moist, but not sticky and not plastic. However, when subjected to a taste test (see below), it feels non-gritty. It is generally very dark when moist or wet, and stains the hands brown or black.
2. **Graininess test:** Rub the soil between your fingers. If sand is present, it will feel "grainy." Determine whether sand comprises more or less than 50% of the sample. Sandy soils often sound gritty when worked in the hand.

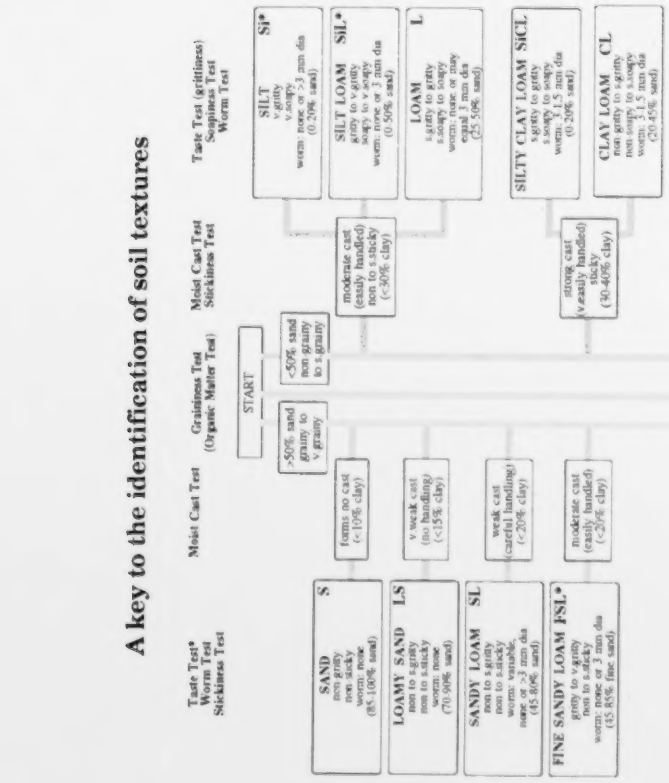


FIGURE 3.3 *Soil texturing key (from Braumandl and Curran [editors] 1992).*

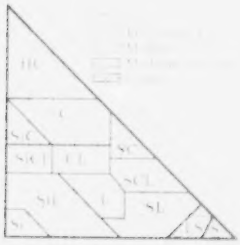
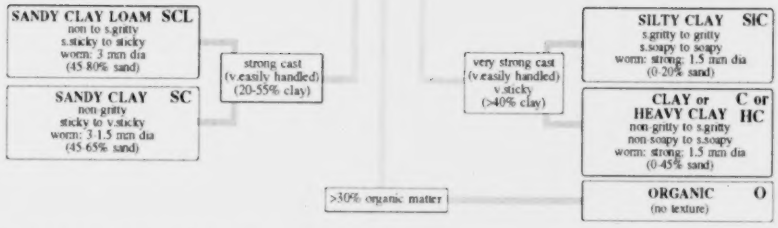
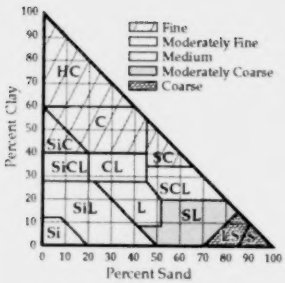

HC
C
SC
SCL
CL
SC
SCL
SiC
SiCL
SiL
Si
L
SiL
S

FIGURE 3.3 *(Continued).*





• Silt feels slippery or soapy when wet; fine sand feels suffer, like grinding compound or fine sandpaper.

Key to Abbreviations	Measurement Conversions
s = slightly	3.0 mm = 1/8"
v = very	1.5 mm = 1/16"
dia = diameter	

Fine Fraction	(particle diameter)
SAND ---------- (S)	2 - .05 mm
SILT ---------- (Si)	.05 - .002 mm
CLAY ---------- (C)	< .002 mm
HEAVY CLAY-- (HC)	> 60 % clay
LOAM ---------- (L)	mix of sand, silt, and clay

TABLE 3.4 *Identification of upland humus forms*

Mors	– matted F horizon[a] – fungal mycelia common – little or no intermixing of organic and mineral materials – abrupt boundary between organic and mineral horizons
Moders	– loosely arranged F horizon – friable[b] – insect droppings – fungal mycelia and soil organisms (arthropods and occasional earthworms) – intermixing of organic and mineral horizons – gradual transition between mineral and organic horizons
Mulls	– often no F or H horizons[c] (thin if present) – insect droppings abundant – usually many soil organisms, but may form from decomposition of a dense network of roots (usually abundant earthworms) – considerable intermixing of mineral and organic layers, with incorporation of organic matter into surface mineral soil (Ah horizon[d])

[a] F horizon: horizon in which partial (rather than entire) macroscopically recognizable vegetative structures are dominant (i.e., the horizon is partially decomposed).
[b] Residues that break down upon rubbing.
[c] H horizon: horizon of highly decomposed organic matter in which original plant vegetative structures are no longer identifiable.
[d] Ah horizon: surface mineral horizon enriched with organic matter (characteristically darker in colour than lower soil layers).

3. **Moist cast test:** Compress some moist (not wet) soil by clenching it in your hand. If the soil holds together (i.e., forms a "cast"), then test the durability of the cast by tossing it from hand to hand. The more durable it is (e.g., like Plasticine), the more clay is present.
4. **Stickiness test:** Wet the soil thoroughly and compress between thumb and forefinger. Determine the degree of stickiness by noting how strongly the soil adheres to the thumb and forefinger when you release the pressure, and by how much it stretches. Stickiness increases with clay content.
5. **Taste test:** Work a small amount of soil between your front teeth. Silt particles are distinguished as fine "grittiness" (e.g., like driving

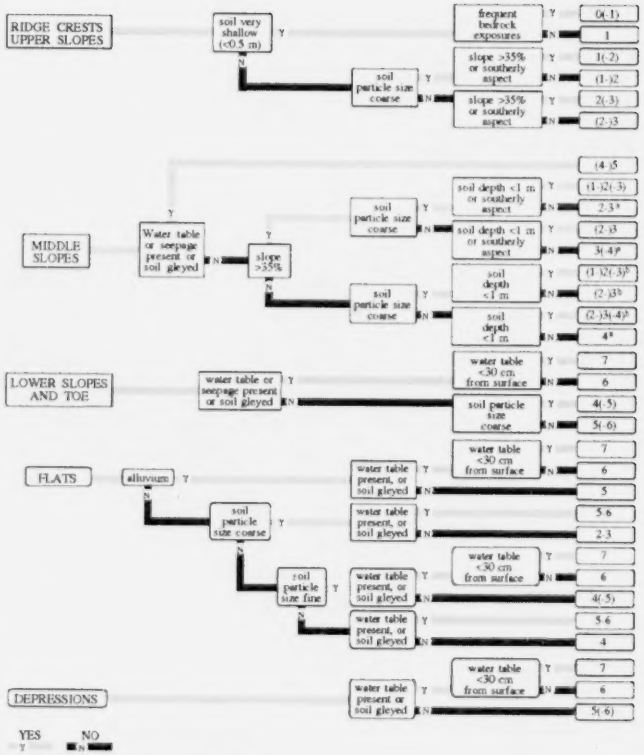
on a dusty road), unlike sand, which is distinguished as individual grains (i.e., graininess). Clay has absolutely no grittiness.

6. **Soapiness test:** Slide thumb and forefinger over wet soil. Degree of soapiness is determined by how soapy/slippery it feels and how much resistance to slip there is (i.e., from clay and sand particles).
7. **Worm test:** Roll some moist soil on your palm with your finger to form the longest, thinnest "worm" possible. The more clay there is in the soil, the longer, thinner, and more durable the worm will be. Try with wetter or drier soil to ensure that you have the correct moisture content (best worm).

Step 3

Using the site and soil factors recorded, determine the relative moisture regime and relative nutrient regime using the keys provided (Figures 3.4 and 3.5, and Table 3.6), and then proceed to Step 4.

Relative soil moisture regimes: Figure 3.4 is intended to assist the user in identifying relative soil moisture regimes using readily observable environmental features. This information should be applied with caution on ridge crests, upper slopes, and middle slopes that have soils with thick (>20 cm) organic layers, and on steep, northerly facing slopes. Moisture regime in these cases will generally be higher than indicated. The soil moisture regime classes 0–7, shown in the key, correspond to the terms very xeric (0) to subhydric (7) displayed on the edatopic grids. Table 3.5 provides definitions for the categories used in the key shown in Figure 3.4. **Ensure you read these definitions before using the key.**



[a]Generally moister if aspect is N or NE
[b]Generally drier if aspect is S or SW

FIGURE 3.4 *A key to the identification of relative soil moisture regimes. (Caution: Read the definitions of particle size and gleying in Table 3.5.)*

1a Coarse textured[1]

- 2a High coarse fragments (>50%), very shallow soil (<30 cm), and/or shallow rooting depth (<15 cm)
  - 3a Mor humus form — *Very Poor*
  - 3b Moder humus form — *Poor – Medium*
- 2b Moderate to low coarse fragments without restricted rooting depth
  - 4a Mor humus form — *Poor*
  - 4b Moder humus form — *Medium*
  - 4c Mull humus form — *Rich – Very Rich*

1b Moderately coarse and medium textured

- 5a High coarse fragments (>50%), very shallow soil (<30 cm), and/or shallow rooting depth (<15 cm)
  - 6a Mor humus form — *Poor*
  - 6b Moder humus form — *Medium*
- 5b Moderate to low coarse fragments without restricted rooting depth
  - 7a Mor humus form — *Poor – Medium*
  - 7b Moder humus form — *Medium – Rich*
  - 7c Mull humus form — *Very Rich*

1c Moderately fine and fine textured

- 8a High coarse fragments (rare), very shallow soil (<30 cm), and/or shallow rooting depth (<15 cm)
  - 9a Mor humus form — *Poor – Very Poor*
  - 9b Moder humus form — *Poor – Medium*
  - 9c Mull humus form — *Rich*
- 8b Moderate to low coarse fragments without restricted rooting depth
  - 10a Mor humus form — *Medium*
  - 10b Moder or Mull humus form — *Rich*

FIGURE 3.5 *Key for estimating relative soil nutrient regimes. Note: presence of base-rich parent materials (limestone, shales, basalt) may improve nutrient status.*

[1] Refer to soil textural triangle (Figure 3.3) for derivation of soil textures.

TABLE 3.5 *Definitions of terms used in the identification of relative soil moisture regimes*[a]

Category	Definition
Ridge crest:	– height of land; usually convex slope shape.
Upper slope:	– the generally convex-shaped, upper portion of a slope.
Middle slope:	– the portion of a slope between the upper and lower slopes; the slope shape is usually straight.
Lower slope:	– the area towards the base of a slope; the slope shape is usually concave. It includes toe slopes, which are generally level areas located directly below and adjacent to the lower slope.
Flat:	– any level area (excluding the slopes); the surface shape is generally horizontal with no significant aspect.
Alluvium:	– post-glacial, active floodplain deposits along rivers and streams in valley bottoms; usually a series of low benches and channels.
Depression:	– any area that is concave in all directions; usually at the foot of a slope or in flat topography.
Soil depth:	– depth from the mineral soil surface to a restricting layer, such as bedrock, strongly compacted materials, or strongly cemented materials (e.g., "hardpan").
Gleyed:	– soils that have orange-coloured mottles indicative of a fluctuating water table. Permanently gleyed soils are dull yellowish, blue, or olive in colour.
Soil particle size coarse:	– sandy[b] with >35% volume of coarse fragments, or loamy[b] with >70% volume of coarse fragments.
Soil particle size fine:	– silty[b] or clayey[b] with <20% volume of coarse fragments.

[a] Adapted from Lloyd et al. (1990) and Green et al. (1984).
[b] Sandy – LS, S; loamy – SL, L, SCL; clayey – SiCL, CL, SC, SiC, C; silty – SiL, Si.

TABLE 3.6 *Table for estimation of soil nutrient regime*

	A very poor	B poor	C medium	D rich	E very rich	F saline
Available nutrients	very low	low	average	plentiful	abundant	excess salt accum.
Humus form	Mor			Moder	Mull	
A horizon	Ae horizon present		A horizon absent		Ah horizon present	
Organic matter content	low (light coloured)	medium (inter in colour)		high (dark coloured)		
C:N ratio	high		moderate		low	
Soil depth	extremely shallow		very shallow to deep			
Soil texture	coarse textured		medium to fine textured			
% coarse fragments	high		moderate to low			
Parent material mineralogy	base-low		base-medium		base-high	
Soil pH	extremely- mod. acid	moderately acid-neutral		slightly acid - mildly alk.		
Water pH (wetlands)	< 4 - 5	4.5 - 5.5	5.5 - 6.5	6.5 - 7.4	7.4 +	
Seepage			temporary ⟶		permanent	

Step 4
From a plot area of at least 0.04 ha (20 × 20 m), identify and record as many of the plant species (including tree species) in the plot as possible. Estimate the percent cover of each of the dominant species (i.e., species covering >5% of the plot). Attempt to adjust the list and coverage estimates according to what you have seen over the remainder of the area covered by the same unit.

Step 5
If the biogeoclimatic unit has previously been determined, proceed to the appropriate biogeoclimatic unit subsection (Table 3.7). If not, use the key following Table 3.7 or the vegetation table (Figure 3.6) to determine it. Note that the vegetation used in Figure 3.6 is that occurring on zonal sites (e.g., edatopic grid 4-C) (see Section 2.2). If the site unit is other than zonal, try to locate a zonal site in the area and note the general floristic features (e.g., dominant tree and understorey species), and compare this information with that found in Figure 3.6 or use the key to identify the biogeoclimatic unit. If the area in question is near a biogeoclimatic unit boundary and doubt remains after the verification step, then identify the site unit for both possible biogeoclimatic units. The descriptions and interpretations for both units should then be compared, and the most appropriate information applied.

TABLE 3.7 *Sections and page numbers of biogeoclimatic unit subsections*

Biogeoclimatic unit	Section	Page number
SBSdw1	5.0	5 • 6
SBSmh	6.0	6 • 8
SBSmw	7.0	7 • 8
SBSvk	8.0	8 • 8
SBSwk1	9.0	9 • 8
ICHvk2	10.0	10 • 6
ESSFwk1	11.0	11 • 8

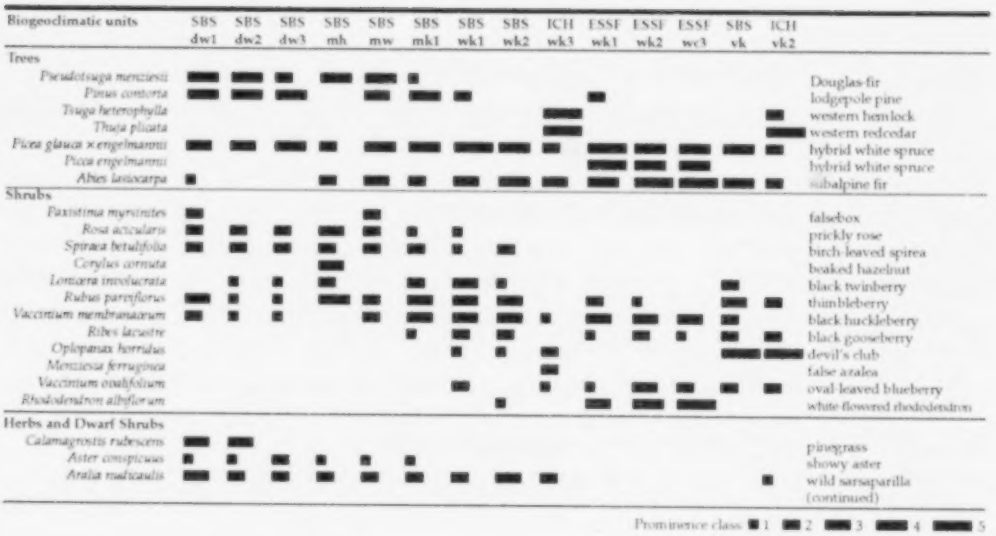
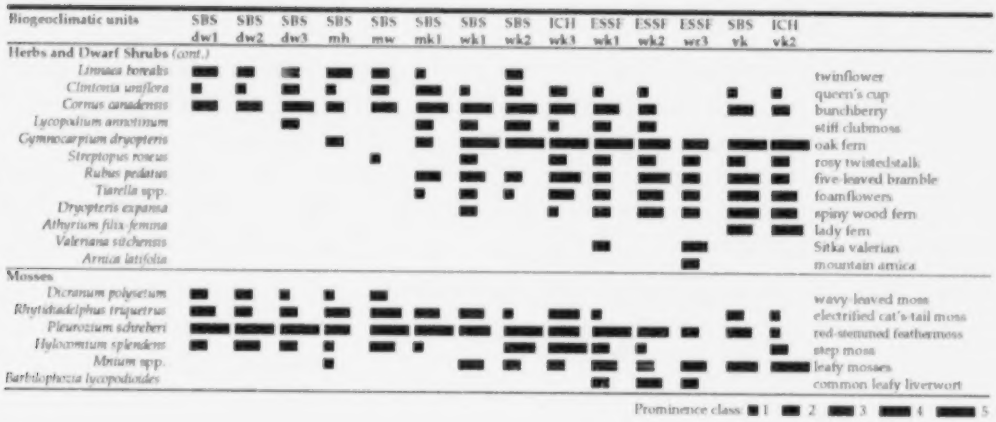


FIGURE 3.6 *Zonal vegetation of biogeoclimatic units within and adjacent to area covered by the guide.*

FIGURE 3.6 *Continued*



Biogeoclimatic Unit Key for SE Guide Area

1a Forest containing western redcedar; primarily located on slopes of Rocky Mountain Trench between 700 and 1200 m elevation.

ICHvk2

1b Forest not containing western redcedar.

2a Generally >1050 m in elevation; tree canopy dominated by subalpine fir and Engelmann spruce; *Rhododendron albiflorum* (white-flowered rhododendron) (p. 41)[2] or *Valeriana sitchensis* (Sitka valerian) (p. 221) present.

3a Generally 1050–1300 m in elevation; mature trees relatively evenly distributed; generally some *Rubus parviflorus* (thimbleberry) (p. 36) on mesic and wetter sites.

ESSFwk1

3b Generally >1300 m in elevation; mature tree distribution often clumpy; *Rubus parviflorus* generally absent on mesic and wetter sites.

ESSFwc3

2b Generally <1050 m in elevation; tree canopy not dominated by subalpine fir and Engelmann spruce; *Rhododendron albiflorum* and *Valeriana sitchensis* absent.

4a Tree canopy generally dominated by hybrid white spruce on mesic and wetter sites; *Oplopanax horridus* (devil's club) (p. 36) and/or *Vaccinium ovalifolium* (oval-leaved blueberry) (p. 42) present on mesic sites.

5a *Gymnocarpium dryopteris* (oak fern) (p. 293) present on most sites; *Oplopanax horridus* abundant (>10% cover) on mesic sites; *Athyrium filix-femina* (lady fern) (p. 291) present on mesic sites.

SBSvk

5b *Gymnocarpium dryopteris* (oak fern) (p. 293) only present on mesic and wetter sites; *Oplopanax horridus* not abundant (<10% cover) on mesic sites; *Athyrium filix-femina* (lady fern) (p. 291) absent on mesic sites.

SBSwk1

[2] Page numbers refer to the publication *Plants of Northern British Columbia* (MacKinnon et al. [editors] 1992).

4b Tree canopy composition variable, but only occasionally dominated by hybrid white spruce on mesic sites; *Oplopanax horridus* and *Vaccinium ovalifolium* absent on mesic sites.

6a Restricted to the lower valley slopes and valley bottoms of the Fraser River in the guide area; *Corylus cornuta* (beaked hazelnut) (p. 38) present and *Paxistima myrsinites* (falsebox) (p. 44) absent on mesic sites.

SBSmh

6b Geographic distribution not as in 6a; *Corylus cornuta* absent and *Paxistima myrsinites* present on mesic sites.

7a *Tiarella trifoliata* (three-leaved foamflower) (p. 147) present on moist sites but *Calamagrostis rubescens* (pinegrass) (p. 240) absent on most sites.

SBSmw

7b *Tiarella trifoliata* absent from moist sites but *Calamagrostis rubescens* present on mesic to xeric sites.

3.5 Identifying Seral Ecosystems

The biogeoclimatic ecological classification was developed based on samples of climax and late seral vegetation (forest stands older than 80 years). Because of this, environmental features must be more heavily relied upon when attempting to assess recently disturbed or seral sites. Since environmental features among site series can overlap considerably, disturbed sites are often difficult to identify. Remnant climax vegetation found in portions of the site not subjected to burning or heavy mechanical site preparation may help in the assessment. Otherwise, vegetation found in an adjacent mature stand with similar environmental features (e.g., same slope position and soil texture) can be used.

3.6 Management Interpretations

Interpretations are provided in two areas of the guide. Within the biogeoclimatic unit subsections (4.1–4.4) are direct interpretations. These relate to specific site units and are contained on the page facing the appropriate unit. Section 12 contains interpretations that can be made at a more general level than the site series, or that are best

handled by indirect interpretation methods that incorporate factors other than moisture and nutrient regime.

3.6.1 Direct interpretations

On the page facing each site unit description is a variety of direct interpretations that have been grouped under the following subheadings.

Site limitations: This section contains statements about ecological conditions that may place limitations on forest productivity or forest operations. The limitations may be either generally applicable to the site unit, or specific to sites with a particular, identified ecological condition. For example, the phrase "sites within this unit with thick organic horizons (>10 cm) will have reduced spring soil temperatures, slowing root development" refers only to sites within the site unit that have organic horizons >10 cm in depth. After each site limitation listed there are recommended solutions to deal with the limitation. This information is in ***bold italic*** text.

Silvicultural system: This section contains some information on silviculture system options that are ecologically appropriate and are based on the dominant natural disturbance regime. Harvesting recommendations or cautions are also contained here.

Site preparation: This section contains site preparation options or directs the user to site preparation keys in Section 12.1. Occasionally, specific comments relating to site preparation are also found here.

Species choice: This section contains species selection information that has been correlated at the site series level across the province. General use species are shown in normal type. Species that have one or more restrictions are in ***bold italic***. The restrictions relating to species in ***bold italic*** are found in one of three sections: site limitations, reforestation, or concerns. When users encounter a species in ***bold italic***, restrictions applicable to that species should be determined by examining these sections. Species found in square brackets (e.g., [Bl]) are species of secondary choice due to a lower ranking of reliability, productivity, or silvicultural feasibility. Species indicated with round brackets (e.g., (Pl, Sb)) are generally significantly less productive than other ecologically acceptable species on the site unit. These species are restricted to comprising a minor proportion (e.g., 20–30%) of the stand or area. These species could be used in only a few localities or blocks within an area, as a minor component of all plantations, or only in test trials. The most recent version of the correlated tree species selection guidelines was used to compile the species choice lists. Minor discrepancies may surface, however, so the user of the guide should attempt to get the most up-to-date guidelines before making final choices.

Vegetation potential: This section subjectively rates the potential of the site to produce non-crop vegetation that may pose a risk to the survival and target growth of the crop tree by limiting light availability. Competition for moisture is not considered. Vegetation species posing the greatest potential threat to the crop tree are listed in brackets when the potential is rated moderate or greater. Before treatments are prescribed to manage these species, the Wildlife Interpretations section (Section 12.2) should be used to determine the importance to wildlife of the vegetation species present.

Reforestation: This section contains specific instructions related to reforestation on the site unit (e.g., advance Bl regeneration should only be accepted if it is likely to reach management objective before it is 150 years old).

Concerns: This section contains concerns of which the user should be aware when preparing a prescription or carrying out forestry operations on a site. Potential solutions to alleviate these concerns are indicated in ***bold italic*** text where appropriate.

3.6.2 Indirect and general interpretations

Indirect and general interpretations are contained for site preparation in Section 12.1 and wildlife in Section 12.2. Guide users should familiarize themselves with this information.

4 GENERAL DESCRIPTION OF BIOGEOCLIMATIC UNITS

The area that this guide covers is primarily in the Sub-Boreal Spruce (SBS) zone. The exception is the Interior Cedar–Hemlock (ICH) zone located in the southeast corner of the study area, and higher elevation areas in the southeast corner of the study area that are in the Engelmann Spruce–Subalpine Fir (ESSF) zone.

The SBS has climax forests dominated by hybrid white spruce (*Picea glauca* × *engelmannii*) and subalpine fir (*Abies lasiocarpa*) on zonal sites. Lodgepole pine (*Pinus contorta*) is a common seral species on zonal sites but also dominates older forest on dry sites. Douglas-fir occurs commonly in the southwest portion of the study area as a long-lived seral species. The ICH has climax forests dominated by western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*). Hybrid white spruce, subalpine fir, and deciduous tree species occur as a component of some younger stands. The ESSF has climax forests dominated by Engelmann spruce (*Picea engelmannii*) and subalpine fir. The understorey is characteristically dominated by white-flowered rhododendron (*Rhododendron albiflorum*), which differentiates these sites from surrounding sites in other zones. Figure 3.6 compares characteristic vegetation among the biogeoclimatic units within the guide area. Table 4.1 summarizes climate data for the biogeoclimatic units within the guide area. Table 4.2 summarizes important wildlife species that use the biogeoclimatic units within the guide area. The biogeoclimatic units described in this guide are SBSdw1, SBSmh, SBSmw, SBSwk1, SBSvk, ICHvk2, and ESSFwk1. The ESSFwc3 occurs within the guide area but was previously described in DeLong et al. (1994).

TABLE 4.1 *Summary of climate data for biogeoclimatic units within the Southeast guide area*[a]

Climatic characteristics		Biogeoclimatic unit							
		SBSdw1	**SBSmw**	**SBSmh**	**SBSwk1**	**SBSvk**	**ICHvk2**	**ESSFwk1**	**ESSFwc3**
Annual precipitation (mm)	Mean	585	N/A[b]	559	931	1247	840	1044	1408
	Range	520–739	N/A	528–601	897–964	990–1635	N/A	N/A	1177–1625
Growing season precipitation (mm)	Mean	286	290	257	345	472	466	426	510
	Range	227–401	276–306	214–287	181–437	405–583	374–538	378–491	402–631
Annual snowfall (cm)	Mean	182	N/A	197	334	N/A	307	538	782
	Range	180–183	N/A	166–226	328–339	N/A	N/A	N/A	N/A
Annual temperature (°C)	Mean	3.7	N/A	4.6	2.6	2.6	3.3	-0.1	-1.0
	Range	3.1–4.2	N/A	4.2–5.0	1.3–4.0	1.3–4.0	3.1–3.4	-1.5–1.4	-3.1–1.1
Growing degree days (>5°C)	Mean	1224	N/A	1428	N/A	N/A	1133	748	671
	Range	1160–1287	N/A	1342–1510	N/A	N/A	N/A	N/A	N/A
Frost-free period (days)	Mean	68	N/A	112	N/A	N/A	72	48	75
	Range	49–86	N/A	104–119	N/A	N/A	N/A	N/A	N/A

[a] Reynolds (1989).
[b] N/A = Not available.

TABLE 4.2 *Some important wildlife species that use biogeoclimatic units in the Southeast guide area*

Species	Occurrence in variants							
	SBSdw1	SBSmw	SBSmh	SBSwk1	SBSvk	ICHvk2	ESSFwk1	ESSFwc3
Mountain Goat							*	*
Caribou[a]				*	*	*	*	
Elk		*		*		*		
Moose	*	*	*	*	*	*		
Mule Deer	*	*	*	*	*	*	*	*
White-tailed Deer	*							
Grizzly Bear[a]				*	*	*	*	*
Wolverine[a]					*		*	*

[a] Denotes species "Blue Listed" in 1989 by the Ministry of Environment. Because of major declines in their populations, these species are considered sensitive and/or deserving of management attention (B.C. Ministry of Environment 1987).

5 HORSEFLY DRY WARM SUB-BOREAL SPRUCE (SBSdw1)

Variant Summary

Location
The SBSdw1 occurs from around Hixon south to the southern boundary of the Prince George Forest Region. It is bordered by the SBSmw to the east and northeast, and by the SBSmh to the west and northwest. This variant extends well into the Cariboo Forest Region.

Elevation range
700–960 m

Climate
The SBSdw1 is dry and warm relative to other biogeoclimatic units in this guide and in the region (see Table 4.1). The warmth of this variant reflects its southern position and relatively low elevation. Winter precipitation is relatively low for this variant, with annual snowfall accumulations of 1–2 m. Climatic growth-limiting factors are drought on drier sites and frost on frost-prone sites.

Distinguishing the SBSdw1 from adjoining biogeoclimatic units
SBSmh has:
- abundant beaked hazelnut in the shrub layer on mesic sites;
- almost no black huckleberry in the shrub layer on mesic sites; and
- no falsebox or pinegrass on mesic sites.

SBSmw has:
- abundant black huckleberry in the shrub layer on very dry sites;
- very little pinegrass in the herb layer on mesic sites; and
- rosy twistedstalk and three-leaved foamflower on mesic sites.

SBSdw2 has:
- little or no falsebox or subalpine fir in the shrub layer on mesic sites.

Forests
The forests of the SBSdw1 variant are among the most diverse SBS forests in the region. Coniferous forests in this unit tend to be mixtures of lodgepole pine, Douglas-fir, and hybrid white spruce with lodgepole pine and/or Douglas-fir dominating on dry to moist sites and hybrid white spruce dominating on wetter sites. Subalpine fir is common on mesic to wet sites. Upland deciduous forests are dominated by trembling aspen, and black cottonwood is common along rivers and streams.

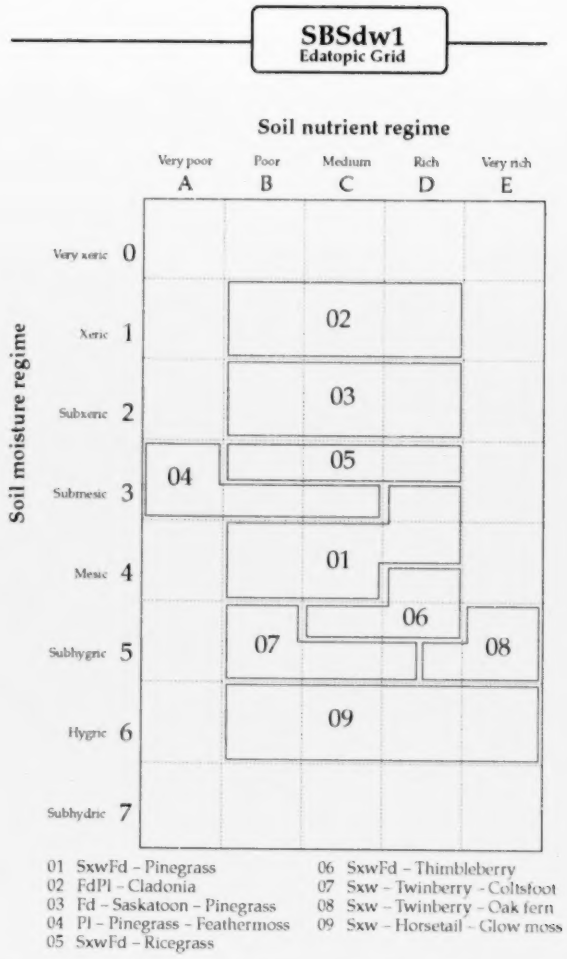


FIGURE 5.1 *Edatopic grid displaying site units of the SBSdw1 variant.*

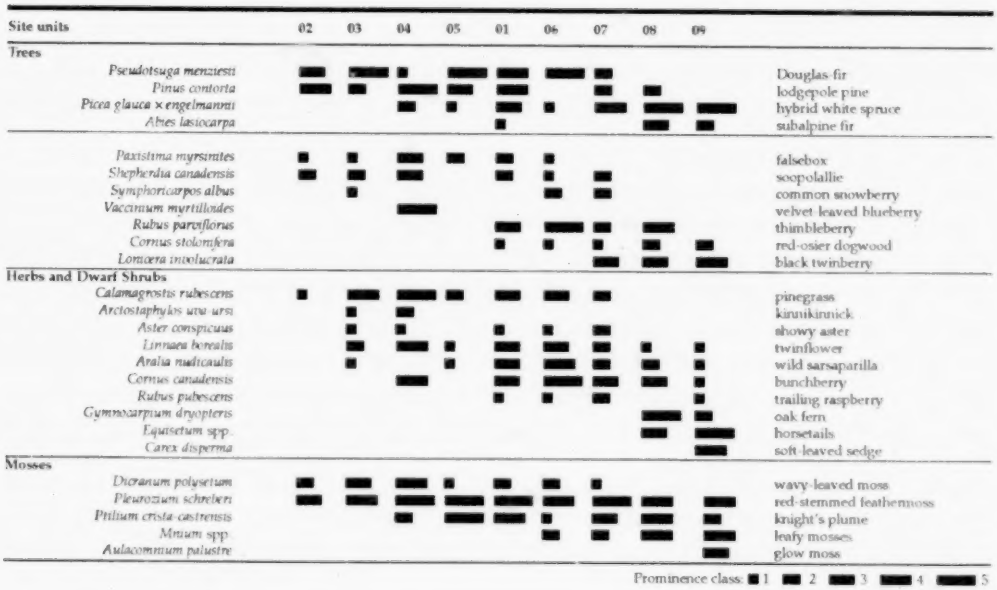


FIGURE 5.2 *SBSdw1 vegetation table.*

Site Series Key

1a Crest or upper slope position; bedrock outcrops often present; soils often shallow (<50 cm); hybrid white spruce and subalpine fir scarce or absent in tree canopy.

SBSdw1/02

1b Not crest position except on subdued hills; bedrock outcrops usually absent; soils deeper; hybrid white spruce and subalpine fir absent to abundant in tree canopy.

2a Slope steep (usually ≥20%).

3a Slope aspect southeasterly, south, southwesterly, or west (100–280°); carpet-like moss layer not present.

4a No significant seepage input; subxeric to submesic moisture regime; *Ribes lacustre* (black gooseberry) (p. 32),[1] and *Cornus canadensis* (bunchberry) (p. 214) usually absent.

SBSdw1/03

4b Intermittent seepage present; subhygric moisture regime; *Ribes lacustre* present, *Cornus canadensis* and *Rubus parviflorus* (thimbleberry) (p. 36) abundant (>10%).

SBSdw1/06

3b Slope aspect northwesterly, north, northeasterly, or east (281–360°, 0–99°); carpet-like moss layer usually present.

SBSdw1/05

2b Slope gentle (usually <20%) or level.

5a Upper to lower slope position or level; no permanent seepage inputs; lodgepole pine usually more abundant than hybrid white spruce; *Gymnocarpium dryopteris* (oak fern) (p. 293), *Ribes lacustre*, *Mnium* spp. (leafy mosses) (pp. 307–308), and *Equisetum arvense* (common horsetail) (p. 282) absent or scarce (<1% cover).

6a Soils sandy (loamy sand or sand), often fluvial materials; *Vaccinium myrtilloides* (velvet-leaved blueberry) (p. 43) and/or *Arctostaphylos uva-ursi* (kinnikinnick) (p. 82) abundant (>5% cover).

SBSdw1/04

[1] Page numbers refer to the publication *Plants of Northern British Columbia* (MacKinnon et al. [editors] 1992).

6b Soils loamy or silty, usually morainal materials; *Vaccinium myrtilloides* and *Arctostaphylos uva-ursi* absent or scarce (<1% cover).

SBSdw1/01

5b Lower or toe slope or depression; permanent seepage or water table within 1 m of surface; hybrid white spruce usually more abundant than lodgepole pine; *Gymnocarpium dryopteris*, *Ribes lacustre*, *Mnium* spp., or *Equisetum arvense* cover often >1%.

7a *Equisetum arvense* abundant (>5% cover); permanent seepage or summer water table within 30 cm of soil surface.

SBSdw1/09

7b *Equisetum arvense* absent or scarce; permanent seepage or water table not within 30 cm of soil surface.

8a *Gymnocarpium dryopteris* abundant (>5% cover); usually fluvial or lacustrine parent materials.

SBSdw1/08

8b *Gymnocarpium dryopteris* absent or scarce; usually morainal materials.

SBSdw1/07

SBSdw1/01 SxwFd – PINEGRASS

Spiraea betulifolia

Cornus canadensis

Pleurozium schreberi

VEGETATION

Tree Layer: 45% cover
lodgepole pine, Douglas-fir, hybrid white spruce, [trembling aspen], [subalpine fir]

Shrub Layer: 35% cover

Spiraea betulifolia	(birch-leaved spirea)
Rosa acicularis	(prickly rose)
Amelanchier alnifolia	(saskatoon)
Paxistima myrsinites	(falsebox)
Viburnum edule	(highbush cranberry)
Rubus parviflorus	(thimbleberry)
Vaccinium membranaceum	(black huckleberry)

hybrid white spruce

Herb Layer: 55% cover

Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Orthilia secunda	(one-sided winter green)
Aralia nudicaulis	(wild sarsaparilla)
Osmorhiza berteroi[2]	(mountain sweet-cicely)
Smilacina racemosa	(false Solomon's-seal)
Goodyera oblongifolia	(rattlesnake-plantain)
Aster conspicuus	(showy aster)
Calamagrostis rubescens	(pinegrass)

Moss Layer: 60% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Dicranum polysetum	(wavy-leaved moss)
Rhytidiadelphus triquetrus	(electrified cat's tail moss)

SOIL AND SITE:

Moisture Regime:	3–4 (submesic–mesic)
Nutrient Regime:	B–D (poor–rich)
Slope Gradient (%):	0–30
Slope Position:	variable; usually mid to lower
Parent Material:	morainal; occasionally fluvial
Soil Texture:	variable
Coarse Fragments (%):	0–70

DISTRIBUTION: very common and often large

[2] Formerly *Osmorhiza chilensis*.

SBSdw1/01 **SxwFd – PINEGRASS**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Silvicultural system:
- assess partial cutting feasibility if Fd is present.

Site preparation:
- see Section 12.1

Species choice:
- Fd, Pl, Sx

Vegetation potential:
- moderate (pinegrass, fireweed, aspen)

Reforestation:
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- attempt to preserve advance Fd regeneration when partial cutting.
- help maintain stand diversity on sites to be planted with Pl by mapping aspen patches prior to harvest and planting these areas to spruce.

Concerns:
- sites within this unit with shallow and/or coarse-textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***site preparation methods that reduce forest floor thickness, such as slashburning or brushblading, must be avoided.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across the site (i.e., lop and scatter).***
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***
- comandra blister rust may cause cankers on pine if bastard toad-flax (Geocaulon lividum) occurs nearby; ***consider planting other species.***
- sites within this unit with fine-textured soils are vulnerable to compaction when wet; ***restrict traffic to winter operations or dry soil conditions.***
- sites within this unit with silty soils are susceptible to frost heaving; ***avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.***

SBSdw1/02 FdPl – CLADONIA

Vaccinium membranaceum

Peltigera malacea

Pleurozium schreberi

VEGETATION

Tree Layer: 20% cover
lodgepole pine, Douglas-fir

Shrub Layer: 15% cover

Vaccinium membranaceum	(black huckleberry)
Amelanchier alnifolia	(saskatoon)
Rosa acicularis	(prickly rose)
Spiraea betulifolia	(birch-leaved spirea)
Paxistima myrsinites	(falsebox)
Shepherdia canadensis	(soopolallie)
Salix scouleriana	(Scouler's willow)
Douglas-fir	
trembling aspen	

Herb Layer: 5% cover

Linnaea borealis	(twinflower)
Calamagrostis rubescens	(pinegrass)
Hieracium albiflorum	(white-flowered hawkweed)

Moss Layer: 10% cover

Peltigera malacea	(apple pelt)
Pleurozium schreberi	(red-stemmed feathermoss)
Dicranum polysetum	(wavy-leaved moss)
Cladina spp.	(cladina lichens)
Ptilium crista-castrensis	(knight's plume)
Polytrichum juniperinum	(juniper haircap moss)
Cladonia spp.	(cladonia lichens)

SOIL AND SITE:

Moisture Regime:	1 (xeric)
Nutrient Regime:	B-D (poor-rich)
* Slope Gradient (%):	0–10
* Slope Position:	crest or upper slope
* Parent Material:	usually morainal
Soil Texture:	variable
Coarse Fragments (%):	5–83

COMMENTS: based on few plots; occurring on hill crests, ridge tops, and upper slopes with shallow (<50 cm) soils

DISTRIBUTION: uncommon and small

SBSdw1/02 **FdPl – CLADONIA**

INTERPRETATIONS

Site limitations:
- site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***leaving a shelterwood overstorey can reduce tree seedling moisture stress.***
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***

Silvicultural system:
- avoid clearcutting; stand re-establishment will be difficult because of high surface soil temperatures and drought.
- leave enough stems to provide shade to the site.

Site preparation:
- avoid site preparation for planting.

Species choice:
- Fd, Pl

Vegetation potential:
- low

Reforestation:
- manage to maintain Fd component.
- fill planting may be required to meet stocking requirements if naturally regenerated.

Concerns:
- these sites may represent important early season range for ungulates; ***discuss management prescriptions with wildlife personnel.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- dwarf mistletoe may cause significant damage to planted or advance regeneration pine, especially where mature pine are maintained in the overstorey.

SBSdw1/03 Fd – SASKATOON – PINEGRASS

Amelanchier alnifolia

VEGETATION

Tree Layer: 35% cover
Douglas-fir, [lodgepole pine]

Shrub Layer: 25% cover

Amelanchier alnifolia	(saskatoon)
Rosa acicularis	(prickly rose)
Spiraea betulifolia	(birch-leaved spirea)
Shepherdia canadensis	(soopolallie)
Symphoricarpos albus	(common snowberry)
Paxistima myrsinites	(falsebox)
[*Prunus virginiana*	(choke cherry)]
Douglas-fir	

Herb Layer: 40% cover

Calamagrostis rubescens	(pinegrass)
Linnaea borealis	(twinflower)
Oryzopsis asperifolia	(rough-leaved ricegrass)
Aster ciliolatus	(fringed aster)
Smilacina racemosa	(false Solomon's-seal)
Fragaria virginiana	(wild strawberry)
Disporum trachycarpum	(rough-fruited fairybells)

Calamagrostis rubescens

Moss Layer: 45% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Dicranum polysetum	(wavy-leaved moss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Ceratodon purpureus	(fire moss)

Pleurozium schreberi

SOIL AND SITE:

Moisture Regime:	2 (subxeric)
Nutrient Regime:	B-D (poor-rich)
* Slope Gradient (%):	20–70
* Slope Aspect:	generally southerly
* Slope Position:	mid or upper
Parent Material:	variable
Soil Texture:	variable
* Coarse Fragments (%):	5–78 (usually >40)

COMMENTS: occurring on steep warm aspects

DISTRIBUTION: uncommon and small

SBSdw1/03 **Fd – SASKATOON – PINEGRASS**

INTERPRETATIONS

Site limitations:
- site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***leaving a shelterwood overstorey can reduce tree seedling moisture stress.***
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***

Silvicultural system:
- avoid clearcutting; stand re-establishment will be difficult because of high surface soil temperatures and drought.
- leave enough stems to provide shade to the site to allow for natural regeneration of Fd.

Site preparation:
- avoid site preparation for planting.

Species choice:
- Pl, *Fd*

Vegetation potential:
- low

Reforestation:
- manage to maintain Fd component.

Concerns:
- these units may represent important early season range for ungulates; ***discuss management prescriptions with wildlife personnel.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- dwarf mistletoe may cause significant damage to planted or advance regeneration pine, especially where mature pine are maintained in the overstorey.

SBSdw1/04 PI – PINEGRASS – FEATHERMOSS

Vaccinium myrtilloides

VEGETATION

Tree Layer: 20% cover
lodgepole pine, [hybrid white spruce]

Shrub Layer: 45% cover

Vaccinium myrtilloides	(velvet-leaved blueberry)
Rosa acicularis	(prickly rose)
Shepherdia canadensis	(soopolallie)
Paxistima myrsinites	(falsebox)
Spiraea betulifolia	(birch-leaved spirea)
Amelanchier alnifolia	(saskatoon)

Engelmann spruce
lodgepole pine
[paper birch]

Paxistima myrsinites

Herb Layer: 80% cover

Calamagrostis rubescens	(pinegrass)
Linnaea borealis	(twinflower)
Cornus canadensis	(bunchberry)
Arctostaphylos uva-ursi	(kinnikinnick)
Lycopodium complanatum	(ground-cedar)
Oryzopsis asperifolia	(rough-leaved ricegrass)
Aster conspicuus	(showy aster)
Chimaphila umbellata	(prince's pine)
Epilobium angustifolium	(fireweed)
Lilium columbianum	(tiger lily)

Moss Layer: 30% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Dicranum polysetum	(wavy-leaved moss)
Peltigera aphthosa	(freckle lichen)
[*Ptilium crista-castrensis*	(knight's plume)]

Calamagrostis rubescens

SOIL AND SITE:

Moisture Regime:	3 (submesic)
Nutrient Regime:	A-C (very poor-medium)
* Slope Gradient (%):	2–10
* Slope Position:	upper, level
Parent Material:	variable; often fluvial
Soil Texture:	variable
Coarse Fragments (%):	0–60

DISTRIBUTION: common and widely distributed

SBSdw1/04 **PI – PINEGRASS – FEATHERMOSS**

INTERPRETATIONS

Site limitations:
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.***

Silvicultural system:
- if Fd stems are present, conduct a stand evaluation to assess if a partial cutting system is feasible.

Site preparation:
- avoid site preparation for planting.
- light scarification for seedbed preparation if required for natural regeneration.

Species choice:
- Pl, ***Sx, Fd***

Vegetation potential:
- low to moderate (pinegrass, fireweed, prickly rose)

Reforestation:
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- attempt to regenerate naturally if potential exists.
- if natural regeneration is not feasible, plant Pl.
- Sx may be planted on moister microsites.

Concerns:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

SBSdw1/05 SxwFd – RICEGRASS

Paxistima myrsinites

Pleurozium schreberi

Ptilium crista-castrensis

VEGETATION

Tree Layer: 55% cover
Douglas-fir, lodgepole pine

Shrub Layer: 10% cover

Paxistima myrsinites	(falsebox)
Spiraea betulifolia	(birch-leaved spirea)
Vaccinium membranaceum	(black huckleberry)
Rosa acicularis	(prickly rose)
Amelanchier alnifolia	(saskatoon)
[*Acer glabrum*	(Douglas maple)]

Herb Layer: 20% cover

Chimaphila umbellata	(prince's pine)
Linnaea borealis	(twinflower)
Cornus canadensis	(bunchberry)
Orthilia secunda	(one-sided wintergreen)
Goodyera oblongifolia	(rattlesnake-plantain)
Calamagrostis rubescens	(pinegrass)
Aralia nudicaulis	(wild sarsaparilla)
Smilacina racemosa	(false Solomon's-seal)
Oryzopsis asperifolia	(rough-leaved ricegrass)

Moss Layer: 75% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Hylocomium splendens	(step moss)
Dicranum polysetum	(wavy-leaved moss)
Peltigera aphthosa	(freckle lichen)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)

SOIL AND SITE:

Moisture Regime:	3 (submesic)
Nutrient Regime:	B-D (poor-rich)
* Slope Gradient (%):	20–70
* Slope Position:	upper
Parent Material:	colluvial, morainal
Soil Texture:	variable
Coarse Fragments (%):	15–83

COMMENTS: usually located on moderately to steeply sloping cool aspects

DISTRIBUTION: uncommon and small

SBSdw1/05 **SxwFd – RICEGRASS**

INTERPRETATIONS

Site limitations:
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.***
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***

Silvicultural system:
- assess partial cutting feasibility if Fd is present.

Site preparation:
- avoid site preparation for planting.
- light scarification for seedbed preparation if required for natural regeneration.

Species choice:
- Fd, Pl, *Sx*

Vegetation potential:
- low to moderate (pinegrass, fireweed, prickly rose)

Reforestation:
- attempt to regenerate naturally if potential exists.
- if natural regeneration is not feasible, plant Pl.
- Sx may be planted on moister microsites.
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.

Concerns:
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- sites within this unit with shallow soil and/or coarse-textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***site preparation methods that reduce forest floor thickness, such as slashburning or brushblading, must be avoided.***

SBSdw1/06 SxwFd – THIMBLEBERRY

Rubus parviflorus

VEGETATION

Tree Layer: 60% cover
Douglas-fir

Shrub Layer: 45% cover

Rubus parviflorus	(thimbleberry)
Symphoricarpos albus	(common snowberry)
Rosa acicularis	(prickly rose)
Spiraea betulifolia	(birch-leaved spirea)
Acer glabrum	(Douglas maple)
Mahonia aquifolium	(tall Oregon-grape)
Ribes lacustre	(black gooseberry)
Douglas-fir	

Herb Layer: 60% cover

Cornus canadensis	(bunchberry)
Aralia nudicaulis	(wild sarsaparilla)
Calamagrostis rubescens	(pinegrass)
Linnaea borealis	(twinflower)
Oryzopsis asperifolia	(rough-leaved ricegrass)
Lathyrus nevadensis	(purple peavine)
Disporum hookeri	(Hooker's fairybells)
Rubus pubescens	(trailing raspberry)
Elymus glaucus	(blue wildrye)
Aster conspicuus	(showy aster)

Cornus canadensis

Moss Layer: 25% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Hylocomium splendens	(step moss)
Dicranum polysetum	(wavy-leaved moss)
Ptilium crista-castrensis	(knight's plume)

Aralia nudicaulis

SOIL AND SITE:

Moisture Regime:	4–5 (mesic-subhygric)
Nutrient Regime:	C-D (medium-rich)
* Slope Gradient (%):	25–44
Slope Position:	mid, lower
Parent Material:	morainal, fluvial
Soil Texture:	variable
Coarse Fragments (%):	15–30

COMMENTS: based on few plots

DISTRIBUTION: uncommon

SBSdw1/06 SxwFd – THIMBLEBERRY

INTERPRETATIONS

Site limitations: – sites within this unit with medium- to fine-textured soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Silvicultural system: – assess partial cutting feasibility.

Site preparation: – see Section 12.1

Species choice: – Fd, Pl, Sx, [*Bl*]

Vegetation potential: – moderate (black twinberry, thimbleberry, fireweed)

Reforestation: – preserve advance Fd regeneration if it is likely to release and form an acceptable stand.

– maintain Fd component, especially veterans that are valuable for wildlife and seed production.

– plant sturdy stock as soon after harvesting as possible.

Concerns: – sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***

– Warren's root collar weevil can cause mortality in young stands, especially where duff layers are thick.

SBSdw1/07 Sxw – TWINBERRY – COLTSFOOT

Rosa acicularis

VEGETATION

Tree Layer: 35% cover
hybrid white spruce, lodgepole pine, [Douglas-fir]

Shrub Layer: 45% cover

Rosa acicularis	(prickly rose)
Lonicera involucrata	(black twinberry)
Viburnum edule	(highbush-cranberry)
Symphoricarpos albus	(common snowberry)
Shepherdia canadensis	(soopolallie)
[*Cornus stolonifera*	(red-osier dogwood)]
hybrid white spruce	

Herb Layer: 70% cover

Cornus canadensis	(bunchberry)
Rubus pubescens	(trailing raspberry)
Linnaea borealis	(twinflower)
Aster conspicuus	(showy aster)
Lathyrus ochroleucus	(creamy peavine)
Petasites frigidus var. *palmatus*	(palmate coltsfoot)
Oryzopsis asperifolia	(rough-leaved ricegrass)
Arnica cordifolia	(heart-leaved arnica)
Fragaria virginiana	(wild strawberry)
Aralia nudicaulis	(wild sarsaparilla)
Smilacina stellata	(star-flowered false Solomon's-seal)

Lonicera involucrata

Moss Layer: 55% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Ptilium crista-castrensis	(knight's plume)

Rubus pubescens

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	B D (poor-rich)
* Slope Gradient (%):	0–15
* Slope Position:	mid, lower, toe
Parent Material:	variable, mostly morainal
Soil Texture:	medium
Coarse Fragments (%):	0–45

DISTRIBUTION: uncommon and small

SBSdw1/07 **Sxw – TWINBERRY – COLTSFOOT**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated) or protect advance regeneration.***

Site preparation:
- see Section 12.1

Species choice:
- Pl, ***Fd, Sx, [Bl]***

Vegetation potential:
- moderate (black twinberry, thimbleberry, fireweed, aspen)

Reforestation:
- preserve advance Fd regeneration if it is likely to release and form an acceptable stand.
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- fill planting may be required after partial cutting.
- plant sturdy stock as soon after harvesting as possible.
- avoid planting of Sx or Fd in obvious frost pockets unless risk can be reduced by providing cover.

Concerns:
- sites within this unit with silty soils are susceptible to frost heaving; ***avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.***
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- Warren's root collar weevil can cause mortality in young stands, especially where duff layers are thick.
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

SBSdw1/08 Sxw – TWINBERRY – OAK FERN

Lonicera involucrata

Gymnocarpium dryopteris

Pleurozium schreberi

VEGETATION

Tree Layer: 50% cover
hybrid white spruce, subalpine fir, [lodgepole pine]

Shrub Layer: 25% cover

Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Rosa acicularis	(prickly rose)
Viburnum edule	(highbush cranberry)
Rubus parviflorus	(thimbleberry)
Cornus stolonifera	(red-osier dogwood)
subalpine fir	

Herb Layer: 40% cover

Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Mitella nuda	(common mitrewort)
Linnaea borealis	(twinflower)
Petasites frigidus var. *palmatus*	(palmate coltsfoot)
Lycopodium annotinum	(stiff clubmoss)
Rubus pubescens	(trailing raspberry)
Galium triflorum	(sweet-scented bedstraw)
Aralia nudicaulis	(wild sarsaparilla)
Smilacina stellata	(star-flowered false Solomon's seal)

Moss Layer: 50% cover

Pleurozium schreberi	(red stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Mnium spp.	(leafy mosses)
Rhytidiadelphus triquetrus	(electrified cat's tail moss)
Hylocomium splendens	(step moss)

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	D-E (rich-very rich)
* Slope Gradient (%):	0–2
* Slope Position:	level or toe
Parent Material:	(glacio)fluvial, lacustrine
Soil Texture:	variable
Coarse Fragments (%):	0–42

COMMENTS: moist seepage sites with rich soils

DISTRIBUTION: common and small

SBSdw1/08 **Sxw – TWINBERRY – OAK FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated) or protect advance regeneration.***

Site preparation:
- see Section 12.1
- sites with thick organic horizons reduce spring soil temperatures, slowing root development; ***attempt to reduce organic horizon thickness during site preparation.***

Species choice:
- Pl, ***Fd, Sx, [Bl]***

Vegetation potential:
- moderate (black twinberry, thimbleberry, fireweed)

Reforestation:
- plant sturdy stock as soon after harvesting as possible.
- avoid planting of Sx or Fd in obvious frost pockets unless cover is provided.

Concerns:
- sites within this unit with silty soils are susceptible to frost heaving; avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- Warren's root collar weevil can cause mortality in young stands, especially where duff layers are thick.
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

SBSdw1/09 Sxw – HORSETAIL – GLOW MOSS

Lonicera involucrata

Equisetum arvense

Carex disperma

VEGETATION

Tree Layer: 25% cover
hybrid white spruce, [subalpine fir]

Shrub Layer: 30% cover

Lonicera involucrata	(black twinflower)
Cornus stolonifera	(red-osier dogwood)
Rosa acicularis	(prickly rose)
Ribes lacustre	(black gooseberry)
Viburnum edule	(highbush-cranberry)
hybrid white spruce	

Herb Layer: 65% cover

Equisetum arvense	(common horsetail)
Carex disperma	(soft-leaved sedge)
Cornus canadensis	(bunchberry)
Mitella nuda	(common mitrewort)
Viola adunca	(early blue violet)
Rubus pubescens	(trailing raspberry)
Linnaea borealis	(twinflower)
Geum rivale	(water avens)
Aralia nudicaulis	(wild sarsaparilla)
Galium triflorum	(sweet-scented bedstraw)
Petasites frigidus var. *palmatus*	(palmate coltsfoot)

Moss Layer: 60% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Ptilium crista-castrensis	(knight's plume)
Hylocomium splendens	(step moss)
[Aulacomnium palustre	(glow moss)]

SOIL AND SITE:

Moisture Regime:	6 (hygric)
Nutrient Regime:	B E (poor-very rich)
* Slope Gradient (%):	0
* Slope Position:	depression, level
Parent Material:	variable
Soil Texture:	medium
Coarse Fragments (%):	0–20

COMMENTS: often occur as inclusions in localized depressions

DISTRIBUTION: common, often associated with watercourses

SBSdw1/09 **Sxw – HORSETAIL – GLOW MOSS**

INTERPRETATIONS

Site limitations:
- very difficult sites to reforest; ***seriously consider managing these sites primarily as wildlife habitat.***
- sites within this unit with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1
- avoid creating an excessive number of mounds (e.g., >300/ha), especially on sites within this unit with a water table <30 cm from the surface.

Species choice:
- ***Sx, [Bl, Pl]***

Vegetation potential:
- high (black twinberry, fireweed, bluejoint)

Reforestation:
- preserve advance regeneration.
- supplement advance regeneration by planting sturdy stock in groups, using available raised microsites.
- consider reducing inter-tree spacing to take advantage of available raised microsites.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- site conditions leading to cold air ponding will lead to frost damage of Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***
- these units may represent important wildlife habitat; ***discuss prescription with wildlife personnel.***
- sites within this unit with thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***
- water table will likely rise above the ground surface in the spring, causing seedling mortality on non-elevated sites.
- this unit is critical to the control of runoff streamflow.

6 MOIST HOT SUB-BOREAL SPRUCE (SBSmh)

Subzone Summary

Location
The SBSmh occurs from around Willow River south along the valley of the Fraser River to the border of the Prince George Forest Region just west of Hixon. It is bordered by the SBSdw2 and SBSdw3 on its western boundary; by the SBSmk1 to the west and north; by the SBSwk1, SBSmk1, and SBSmw to the east; and by the SBSdw1 to the southeast and south. This subzone extends well into the Cariboo Forest Region.

Elevation range
460–725 m

Climate
The SBSmh is dry and warm relative to other biogeoclimatic units of the guide area, and is one of the warmest units in the region (see Table 4.1). The relative warmth reflects its protected location in the valley of the Fraser River. Winter snowfall is relatively low, and the number of growing degree days is probably the highest in the region.

Distinguishing the SBSmh from adjoining biogeoclimatic units
SBSdw1 has:
- falsebox and no hazelnut on mesic sites; and
- more red-osier dogwood on mesic and wetter sites.

SBSdw2 has:
- pinegrass and no hazelnut on mesic sites; and
- more red-osier dogwood on mesic and wetter sites.

SBSdw3 has:
- stiff clubmoss and no hazelnut on mesic sites; and
- Sitka alder on submesic to subhygric sites.

SBSmk1 has:
- stiff clubmoss and five-leaved bramble on mesic sites;
- little to no Douglas-fir on mesic sites; and
- no Douglas maple or hazelnut.

SBSmw has:
- common foamflower and rosy twistedstalk on mesic sites but no hazelnut; and
- black huckleberry on subxeric and submesic sites.

SBSwk1 has:

- black huckleberry and oval-leaved blueberry in the shrub layer;
- rosy twistedstalk on mesic to hygric sites;
- Douglas-fir restricted to subxeric to submesic sites; and
- black twinberry found on submesic to hygric sites.

Forests

Forests of the SBSmh tend to be a mixture of Douglas-fir (more on the drier sites) and hybrid white spruce (more on the wetter sites), with lesser amounts of paper birch and subalpine fir. Lodgepole pine dominates some of the drier sites, while black cottonwood can dominate on wet sites.

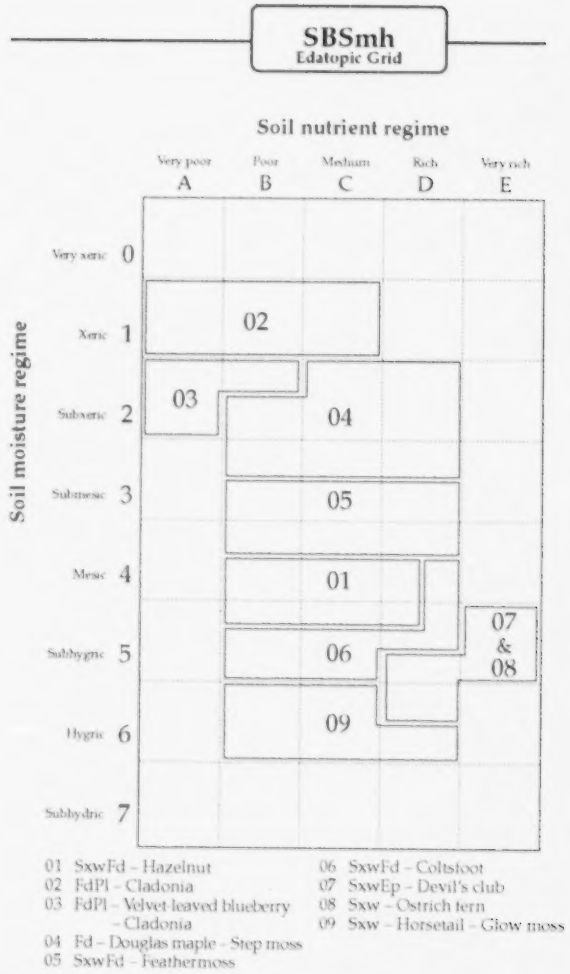


FIGURE 6.1 *Edatopic grid displaying site units of the SBSmh subzone.*

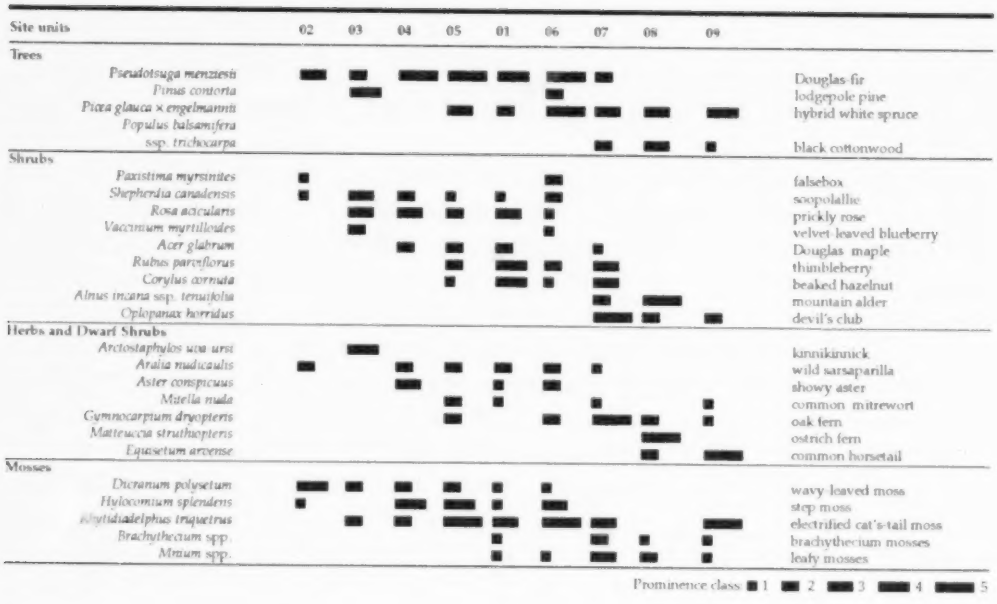


FIGURE 6.2 *SBSmh vegetation table.*

Site Series Key

1a Soils shallow (<50 cm); often crest slope position; very open tree canopy; shrub layer sparse (<5%), dominated by *Paxistima myrsinites* (falsebox) (p. 44)[1] and *Shepherdia canadensis* (soopolallie) (p. 49).

SBSmh/02

1b Soils deeper (>50 cm); not crest slope position; canopy less open; shrub layer cover >5%, dominant species is variable.

2a Slopes steep (>35%), aspect mostly south to west (180–320°), rarely northwest; *Viola adunca* (early blue violet) (p. 177) and *Vicia americana* (American vetch) (p. 169) present.

SBSmh/04

2b Slopes gentler (<35%) or if steep then aspect northwest to east (281–360°, 1–109°); *Viola adunca* and *Vicia americana* usually absent or minor cover (<1%).

3a Tree canopy dominated by lodgepole pine; parent materials rapidly drained, gravelly sandy glaciofluvial on level sites; *Calamagrostis rubescens* (pinegrass) (p. 240), *Arctostaphylos uva-ursi* (kinnikinnik) (p. 82), and *Cladina rangiferina* (reindeer lichen) (p. 334) present; *Galium triflorum* (sweet-scented bedstraw) (p. 220), *Mitella nuda* (common mitrewort) (p. 145), and *Smilacina racemosa* (false Solomon's-seal) (p. 130) absent or minor cover (<1%).

SBSmh/03

3b Tree canopy generally not dominated by lodgepole pine; soils not rapidly drained and if parent materials are gravelly sandy glaciofluvial, then receiving seepage; *Calamagrostis rubescens*, *Arctostaphylos uva-ursi*, and *Cladina rangiferina* generally absent; *Galium triflorum*, *Mitella nuda*, and *Smilacina racemosa* present (>1%).

4a *Petasites frigidus* var. *palmatus* (palmate coltsfoot) (p. 114), *Streptopus amplexifolius* (clasping twistedstalk) (p. 128), *Tiarella trifoliata* (foamflower) (p. 147), *Equisetum arvense* (common horsetail) (p. 282), or *Dryopteris expansa* (spiny wood fern) (p. 292) present.

[1] Page numbers refer to the publication *Plants of Northern British Columbia* (MacKinnon et al. [editors] 1992).

5a *Matteuccia struthiopteris* (ostrich fern) abundant (>30% cover) and *Geum macrophyllum* (large-leaved avens) (p. 160) present; usually floodplains subject to periodic flooding.

SBSmh/08

5b *Matteuccia struthiopteris* and *Geum macrophyllum* absent; usually not alluvial floodplain.

6a *Equisetum* spp. (horsetails) (pp. 281–284) abundant (>40% cover), *Carex disperma* (soft-leaved sedge) (p. 260) present.

SBSmh/09

6b *Equisetum* spp. absent or incidental (<1% cover), *Carex disperma* absent.

7a *Oplopanax horridus* (devil's club) (p. 36) abundant (>10% cover) and *Dryopteris expansa* and *Tiarella trifoliata* present; total cover of feathermosses low to moderate (<20% cover); *Shepherdia canadensis* and *Aster conspicuus* (showy aster) (p. 116) absent.

SBSmh/07

7b *Oplopanax horridus*, *Dryopteris expansa*, and *Tiarella trifoliata* absent; total cover of feathermosses higher (>20% cover); *Shepherdia canadensis* and *Aster conspicuus* present.

SBSmh/06

4b *Petasites frigidus* var. *palmatus*, *Streptopus amplexifolius*, *Tiarella trifoliata*, *Equisetum arvense*, and *Dryopteris expansa* absent.

8a Moss layer well developed (>50% cover); *Chimaphila umbellata* (prince's pine) (p. 90) present; parent material predominantly gravelly loamy or sandy fluvial.

SBSmh/05

8b Moss layer poorly to moderately developed (<20% cover); *Chimaphila umbellata* absent; parent material variable.

SBSmh/01

NOTES

SBSmh/01 SxwFd – HAZELNUT

Rubus parviflorus

VEGETATION

Tree Layer: 35% cover
Douglas-fir, hybrid white spruce, paper birch

Shrub Layer: 50% cover

Rubus parviflorus	(thimbleberry)
Rosa acicularis	(prickly rose)
Corylus cornuta	(beaked hazelnut)
Cornus stolonifera	(red-osier dogwood)
Viburnum edule	(highbush-cranberry)
Ribes lacustre	(black gooseberry)
Spiraea betulifolia	(birch-leaved spirea)
Amelanchier alnifolia	(saskatoon)
Mahonia aquifolium	(tall Oregon-grape)
Lonicera involucrata	(black twinberry)
Acer glabrum	(Douglas maple)
Shepherdia canadensis	(soopolallie)

Corylus cornuta

Herb Layer: 30% cover

Aralia nudicaulis	(wild sarsaparilla)
Cornus canadensis	(bunchberry)
Lathyrus ochroleucus	(creamy peavine)
Oryzopsis asperifolia	(rough-leaved ricegrass)
Linnaea borealis	(twinflower)
Disporum hookeri	(Hooker's fairybells)
Mitella nuda	(common mitrewort)
Galium triflorum	(sweet-scented bedstraw)
Aster conspicuus	(showy aster)
Rubus pubescens	(trailing raspberry)

Moss Layer: 20% cover

Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)

Aralia nudicaulis

SOIL AND SITE:

Moisture Regime:	4–5 (mesic-subhygric)
Nutrient Regime:	B-D (poor-rich)
* Slope Gradient (%):	0–15
* Slope Position:	mid to level
Parent Material:	mostly (glacio)fluvial, some lacustrine
Soil Texture:	medium to coarse, some fine
* Coarse Fragments (%):	0–50 (usually 0)

DISTRIBUTION: common and widely distributed

SBSmh/01 **SxwFd – HAZELNUT**

INTERPRETATIONS

Site limitations: – sites within this unit with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Silvicultural system: – assess partial cutting feasibility if Fd is present.

Site preparation: – see Section 12.1

Species choice: – Fd, Pl, Sx, *[Bl]*

Vegetation potential: – moderate (pinegrass, fireweed, aspen)

Reforestation: – manage to maintain Fd component.

– attempt to preserve advance Fd regeneration when partial cutting.

– help maintain stand diversity on sites to be planted with Pl by mapping aspen patches prior to harvest and planting these areas with spruce.

– maintain Fd component, especially veterans that are valuable for wildlife and seed production.

Concerns: – site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

– sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***

– sites within this unit with silty soils are susceptible to frost heaving; ***avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.***

SBSmh/02 FdPl – CLADONIA

Paxistima myrsinites

Aralia nudicaulis

Pleurozium schreberi

VEGETATION

Tree Layer: 15% cover
Douglas-fir, subalpine fir, paper birch

Shrub Layer: 10% cover

Paxistima myrsinites	(falsebox)
Shepherdia canadensis	(soopolallie)
Acer glabrum	(Douglas maple)
Amelanchier alnifolia	(saskatoon)
Juniperus communis	(common juniper)
Mahonia aquifolium	(tall Oregon-grape)
Ribes oxyacanthoides	(northern gooseberry)
Rosa acicularis	(prickly rose)
Spiraea betulifolia	(birch-leaved spirea)
paper birch	
Douglas-fir	

Herb Layer: 10% cover

Aralia nudicaulis	(wild sarsaparilla)
Linnaea borealis	(twinflower)
Oryzopsis asperifolia	(rough-leaved ricegrass)
Arctostaphylos uva-ursi	(kinnikinnick)
Arnica cordifolia	(heart-leaved arnica)

Moss Layer: 55% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Dicranum polysetum	(wavy-leaved moss)
Cladina arbuscula	(cladina lichen)
Hylocomium splendens	(step moss)
Peltigera aphthosa	(freckle lichen)
Peltigera malacea	(toad lichen)
Cladonia spp.	(cladonia lichens)

SOIL AND SITE:

Moisture Regime:	1 (xeric)
Nutrient Regime:	A-C (very poor-medium)
Slope Gradient (%):	0–10
* Slope Position:	crest
* Parent Material:	fluvial
* Soil Texture:	coarse
Coarse Fragments (%):	65

COMMENTS: based on few plots; often occur on thin soils as small inclusions within other site series that are being harvested

DISTRIBUTION: uncommon and small

SBSmh/02 **FdPl - CLADONIA**

INTERPRETATIONS

Site limitations:	- site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***
	- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***
Silvicultural system:	- avoid clearcutting; stand re establishment will be difficult because of high surface soil temperatures and drought.
Site preparation:	- light scarification for seedbed preparation or summer logging with no site preparation.
Species choice:	- Fd, Pl
Vegetation potential:	- low
Reforestation:	- manage to maintain Fd component.
	- leave as many Fd stems as possible for shade to help reduce excessive drying or heating of upper soil horizons.
	- promote natural Fd and Pl regeneration by light scarification or spot screefing.
	- fill planting may be required after partial cutting.
Concerns:	- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***leaving a shelterwood overstorey can reduce tree seedling moisture stress.***
	- these sites are vulnerable to nutrient deficiency if forest floors are reduced; ***site preparation methods that reduce forest floor thickness, such as slashburning or brushblading, must be avoided.***
	- these sites may represent important early season range for wildlife; ***discuss management prescriptions with wildlife personnel.***
	- avoid clearcutting as stand re-establishment would likely be difficult because of high surface soil temperatures and drought.

SBSmh/03 FdPl - VELVET-LEAVED BLUEBERRY - CLADONIA

Shepherdia canadensis

Rosa acicularis

Arctostaphylos uva-ursi

VEGETATION

Tree Layer: 25% cover
lodgepole pine, Douglas fir, paper birch

Shrub Layer: 45% cover

Shepherdia canadensis	(soopolallie)
Rosa acicularis	(prickly rose)
Vaccinium myrtilloides	(velvet leaved blueberry)
Spiraea betulifolia	(birch leaved spirea)
Douglas fir	
[lodgepole pine]	

Herb Layer: 30% cover

Arctostaphylos uva-ursi	(kinnikinnick)
Linnaea borealis	(twinflower)
Vaccinium caespitosum	(dwarf blueberry)
Chimaphila umbellata	(prince's pine)
Fragaria virginiana	(wild strawberry)
Maianthemum canadense	(wild lily of the valley)
Oryzopsis asperifolia	(rough leaved ricegrass)
[*Calamagrostis rubescens*	(pinegrass)]
[*Cornus canadensis*	(bunchberry)]

Moss Layer: 65% cover

Pleurozium schreberi	(red stemmed feathermoss)
Dicranum polysetum	(wavy leaved moss)
[*Cladina rangiferina*	(grey reindeer lichen)]
[*Ptilium crista-castrensis*	(knight's plume)]
[*Rhytidiadelphus triquetrus*	(electrified cat's tail moss)]
[*Cladonia* spp.	(cladonia lichens)]

SOIL AND SITE:

Moisture Regime:	2 (subxeric)
Nutrient Regime:	A-B (very poor-poor)
* Slope Gradient (%):	0–10
* Slope Position:	lower-toe, or level
* Parent Material:	fluvial and glaciofluvial
* Soil Texture:	coarse
* Coarse Fragments (%):	65–75

COMMENTS: based on few plots

DISTRIBUTION: rare

SBSmh/03 FdPl – VELVET-LEAVED BLUEBERRY – CLADONIA

INTERPRETATIONS

Site limitations:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***

Silvicultural system:
- avoid clearcutting; stand re-establishment will be difficult because of high surface soil temperatures and drought.
- leave enough stems to provide shade to the site.

Site preparation:
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Pl, *Fd, Sx, [Bl]*

Vegetation potential:
- low

Reforestation:
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- attempt to preserve advance Fd regeneration when partial cutting.
- fill planting may be required after partial cutting.

Concerns:
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***leaving a shelterwood overstorey can reduce tree seedling moisture stress.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- these sites may represent important early season range for wildlife; ***discuss management prescriptions with wildlife personnel.***
- dwarf mistletoe may cause significant damage to planted or advance regeneration pine, especially where mature pine are maintained in the overstorey.

SBSmh/04 Fd – DOUGLAS MAPLE – STEP MOSS

Rosa acicularis

Spiraea betulifolia

Pleurozium schreberi

VEGETATION

Tree Layer: 30% cover
Douglas fir, [subalpine fir]

Shrub Layer: 20% cover

Rosa acicularis	(prickly rose)
Spiraea betulifolia	(birch leaved spirea)
Shepherdia canadensis	(soopolallie)
Amelanchier alnifolia	(saskatoon)
Mahonia aquifolium	(tall Oregon grape)
Acer glabrum	(Douglas maple)
Cornus stolonifera	(red-osier dogwood)
Prunus virginiana	(choke cherry)
Douglas fir	
subalpine fir	

Herb Layer: 20% cover

Disporum trachycarpum	(rough fruited fairybells)
Lathyrus ochroleucus	(creamy peavine)
Aster conspicuus	(showy aster)
Aralia nudicaulis	(wild sarsaparilla)
Linnaea borealis	(twinflower)
Fragaria virginiana	(wild strawberry)
Aster ciliolatus	(fringed aster)

Moss Layer: 40% cover

Pleurozium schreberi	(red stemmed feathermoss)
Hylocomium splendens	(step moss)
Rhytidiadelphus triquetrus	(electrified cat's tail moss)
Dicranum polysetum	(wavy-leaved moss)

SOIL AND SITE:

Moisture Regime:	2–3 (subxeric–submesic)
Nutrient Regime:	B D (poor rich)
* Aspect:	usually southerly
* Slope Gradient (%):	40–90, often >60
Slope Position:	upper or mid
Parent Material:	colluvial veneers and blankets; also (glacio) fluvial and lacustrine
Soil Texture:	medium to coarse
* Coarse Fragments (%):	0–80, often >70

COMMENTS: restricted to dry, steep warm aspects

DISTRIBUTION: common

SBSmh/04 **Fd – DOUGLAS MAPLE – STEP MOSS**

INTERPRETATIONS

Site limitations:	– site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.***
	– sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by leaving Fd seed trees on site.***
Silvicultural system:	– assess partial cutting feasibility.
	– avoid clearcutting as stand re-establishment would likely be difficult because of high surface soil temperatures and drought.
Site preparation:	– light scarification for seedbed preparation or summer logging with no site preparation.
Species choice:	– Fd, (*Bl, Sx*)
Vegetation potential:	– low to moderate (pinegrass, fireweed, prickly rose)
Reforestation:	– maintain component of larger Fd, especially veterans that are valuable for wildlife and seed production.
	– attempt to regenerate naturally or, if not feasible, plant Fd.
	– fill planting may be required after partial cutting.
	– Sx may be planted on moister microsites.
Concerns:	– full tree harvesting may lead to nutrient depletion; ***distribute woody debris across these sites.***
	– site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***leaving a shelterwood overstorey can reduce tree seedling moisture stress.***
	– sites within this unit with shallow and/or coarse textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***

SBSmh/05 **SxwFd – FEATHERMOSS**

Rosa acicularis

VEGETATION

Tree Layer: 25% cover
Douglas fir, hybrid white spruce, paper birch, [subalpine fir]

Shrub Layer: 30% cover

Rosa acicularis	(prickly rose)
Spiraea betulifolia	(birch leaved spirea)
Rubus parviflorus	(thimbleberry)
Acer glabrum	(Douglas maple)
Amelanchier alnifolia	(saskatoon)
Ribes lacustre	(black gooseberry)
Sorbus scopulina	(western mountain ash)
Douglas fir	
hybrid white spruce	

Linnaea borealis

Herb Layer: 25% cover

Linnaea borealis	(twinflower)
Cornus canadensis	(bunchberry)
Aralia nudicaulis	(wild sarsaparilla)
Maianthemum canadense	(wild lily-of-the-valley)
Chimaphila umbellata	(prince's pine)
Mitella nuda	(common mitrewort)
Smilacina racemosa	(false Solomon's-seal)
Oryzopsis asperifolia	(rough leaved ricegrass)
Gymnocarpium dryopteris	(oak fern)
Disporum hookeri	(Hooker's fairybells)

Pleurozium schreberi

Moss Layer: 65% cover

Pleurozium schreberi	(red stemmed feathermoss)
Rhytidiadelphus triquetrus	(electrified cat's tail moss)
Hylocomium splendens	(step moss)
Dicranum polysetum	(wavy leaved moss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE:

Moisture Regime:	3–4 (submesic–mesic)
Nutrient Regime:	B-D (poor–rich)
Slope Gradient (%):	0–70 (usually <20)
Slope Position:	variable
Parent Material:	usually fluvial; some morainal and lacustrine
Soil Texture:	variable
Coarse Fragments (%):	0–85 (often >40)

DISTRIBUTION: common

SBSmh/05 **SxwFd - FEATHERMOSS**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Silvicultural system:
- assess partial cutting feasibility if Fd is present.

Site preparation:
- see Section 12.1

Species choice:
- Fd, Pl, Sx, [*Bl*]

Vegetation potential:
- moderate (thimbleberry, fireweed, aspen)

Reforestation:
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- attempt to preserve advance Fd regeneration when partial cutting.
- help maintain stand diversity on sites to be planted with Pl by mapping aspen patches prior to harvest and planting these areas with spruce.

Concerns:
- sites within this unit with shallow and/or coarse textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***
- sites with fine textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- sites within this unit with silty soils are susceptible to frost heaving, ***avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.***

SBSmh/06 SxwFd – COLTSFOOT

Viburnum edule

Aster conspicuus

Rhytidiadelphus triquetrus

VEGETATION

Tree Layer: 55% cover
Douglas fir, hybrid white spruce, paper birch, lodgepole pine

Shrub Layer: 40% cover

Viburnum edule	(highbush cranberry)
Shepherdia canadensis	(soopolallie)
Amelanchier alnifolia	(saskatoon)
Cornus stolonifera	(red-osier dogwood)
Rubus parviflorus	(thimbleberry)
Spiraea betulifolia	(birch-leaved spirea)
Lonicera involucrata	(black twinberry)
Rosa acicularis	(prickly rose)
Corylus cornuta	(beaked hazelnut)

hybrid white spruce

Herb Layer: 35% cover

Cornus canadensis	(bunchberry)
Aralia nudicaulis	(wild sarsaparilla)
Aster conspicuus	(showy aster)
Linnaea borealis	(twinflower)
Orthilia secunda	(one-sided wintergreen)
Arnica cordifolia	(heart-leaved arnica)
Clintonia uniflora	(queen's cup)
Disporum hookeri	(Hooker's fairybells)
Thalictrum occidentale	(western meadowrue)
Petasites frigidus var. *palmatus*	(palmate coltsfoot)

Moss Layer: 70% cover

Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)

SOIL AND SITE:

Moisture Regime:	4–5 (mesic–subhygric)
Nutrient Regime:	B–D (poor–rich)
* Slope Gradient (%):	0–9
* Slope Position:	lower or level
Parent Material:	variable
Soil Texture:	variable
Coarse Fragments (%):	2–40

COMMENTS: based on few plots

DISTRIBUTION: uncommon and small

SBSmh/06 **SxwFd – COLTSFOOT**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine textured soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Site preparation:
- see Section 12.1

Species choice:
- Fd, Pl, Sx, [*Bl*]

Vegetation potential:
- moderate (black twinberry, thimbleberry, fireweed)

Reforestation:
- attempt to preserve advance Fd regeneration when partial cutting.
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- plant sturdy stock as soon after harvesting as possible.

Concerns:
- sites within this unit with fine textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- sites within this unit with silty soils are susceptible to frost heaving; ***avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.***
- Warren's root collar weevil can cause mortality in young stands, especially where duff layers are thick.

SBSmh/07 SxwEp – DEVIL'S CLUB

Oplopanax horridus

VEGETATION

Tree Layer: 30% cover
hybrid white spruce, Douglas fir, [paper birch]

Shrub Layer: 40% cover

Oplopanax horridus	(devil's club)
Acer glabrum	(Douglas maple)
Ribes lacustre	(black gooseberry)
Rubus parviflorus	(thimbleberry)
Cornus stolonifera	(red-osier dogwood)
Viburnum edule	(highbush-cranberry)
[*Lonicera involucrata*	(black twinberry)]
[*Corylus cornuta*	(beaked hazelnut)]

Herb Layer: 30% cover

Gymnocarpium dryopteris	(oak fern)
Dryopteris expansa	(spiny wood fern)
Tiarella trifoliata ssp. *unifoliata*	(one-leaved foamflower)
Mitella nuda	(common mitrewort)
Streptopus amplexifolius	(clasping twistedstalk)
Galium triflorum	(sweet-scented bedstraw)
Aralia nudicaulis	(wild sarsaparilla)
Cornus canadensis	(bunchberry)
[*Disporum hookeri*	(Hooker's fairybells)]

Dryopteris expansa

Moss Layer: 10% cover

Rhytidiadelphus triquetrus	(electrified cat's tail moss)
Brachythecium spp.	(ragged mosses)
Pleurozium schreberi	(step moss)
Mnium spp.	(leafy mosses)

SOIL AND SITE:

Moisture Regime:	5–6 (subhygric–hygric)
Nutrient Regime:	D–E (rich–very rich)
Slope Gradient (%):	0–50
Slope Position:	mid-slope to level or depression
Parent Material:	(glacio)fluvial, some lacustrine
Soil Texture:	medium to coarse
Coarse Fragments (%):	0–50

Rhytidiadelphus triquetrus

DISTRIBUTION: common

SBSmh/07 **SxwEp - DEVIL'S CLUB**

INTERPRETATIONS

Site limitations:
- sites within this unit with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1

Species choice:
- Fd, Sx, [*Bl*]

Vegetation potential:
- moderate (black twinberry, thimbleberry, fireweed, aspen)

Reforestation:
- attempt to preserve advance Fd regeneration when partial cutting.
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- plant sturdy stock as soon after harvesting as possible.
- avoid planting of Sx or Fd in obvious frost pockets unless cover is provided.

Concerns:
- sites within this unit with silty soils are susceptible to frost heaving; ***avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.***
- sites within this unit with fine textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- Warren's root collar weevil can cause mortality in young stands, especially where duff layers are thick.
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

SBSmh/08 Sxw – OSTRICH FERN

Alnus incana ssp. *tenuifolia*

Matteuccia struthiopteris

Urtica dioica

VEGETATION

Tree Layer: 20% cover
hybrid white spruce, black cottonwood, subalpine fir

Shrub Layer: 50% cover

Oplopanax horridus	(devil's club)
Sambucus racemosa	(red elderberry)
Alnus incana ssp. *tenuifolia*	(mountain alder)
Cornus stolonifera	(red osier dogwood)
[*Lonicera involucrata*	(black twinberry)]

Herb Layer: 90% cover

Matteuccia struthiopteris	(ostrich fern)
Urtica dioica	(stinging nettle)
Circaea alpina	(enchanter's nightshade)
Gymnocarpium dryopteris	(oak fern)
Galium triflorum	(sweet scented bedstraw)
Geum macrophyllum	(large leaved avens)
Tiarella trifoliata ssp. *unifoliata*	(one leaved foamflower)
[*Equisetum pratense*	(meadow horsetail)]
[*Equisetum arvense*	(common horsetail)]

Moss Layer: 5% cover

Mnium spp.	(leafy mosses)
Brachythecium spp.	(ragged mosses)
[*Marchantia polymorpha*	(green tongue liverwort)]

SOIL AND SITE:

Moisture Regime:	5–6 (subhygric–hygric)
Nutrient Regime:	D–E (rich–very rich)
* Slope Gradient (%):	0–7
* Slope Position:	level, toe
* Parent Material:	fluvial
Soil Texture:	medium to coarse
Coarse Fragments (%):	2–35

COMMENTS: restricted to localized rich floodplain sites

DISTRIBUTION: uncommon

SBSmh/08 **Sxw - OSTRICH FERN**

INTERPRETATIONS

Site limitations:	- very difficult sites to reforest; ***seriously consider managing these sites as wildlife corridors.***
	- sites within this unit with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***
Site preparation:	- see Section 12.1
	- sites with thick organic horizons reduce spring soil temperatures, slowing root development; ***attempt to reduce organic horizon thickness during site preparation.***
Species choice:	- ***Fd, Sx, [Bl]***
Vegetation potential:	- high (black twinberry, thimbleberry, fireweed)
Reforestation:	- fill planting may be required after partial cutting.
	- plant sturdy stock as soon after harvesting as possible.
	- avoid planting Sx or Fd in obvious frost pockets unless cover is provided.
Concerns:	- sites within this unit with silty soils are susceptible to frost heaving; ***avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.***
	- sites within this unit with fine textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
	- Warren's root collar weevil can cause mortality in young stands, especially where duff layers are thick.
	- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or preserving advance regeneration are advised.***

SBSmh/09 Sxw – HORSETAIL – GLOW MOSS

Lonicera involucrata

Equisetum arvense

Rhytidiadelphus triquetrus

VEGETATION

Tree Layer: 20% cover
hybrid white spruce, trembling aspen, paper birch, black cottonwood

Shrub Layer: 10% cover

Lonicera involucrata	(black twinberry)
Oplopanax horridus	(devil's club)
Cornus stolonifera	(red-osier dogwood)
Ribes lacustre	(black gooseberry)
Amelanchier alnifolia	(saskatoon)
Rosa acicularis	(prickly rose)
subalpine fir	
hybrid white spruce	

Herb Layer: 80% cover

Equisetum arvense	(common horsetail)
Equisetum scirpoides	(dwarf scouring-rush)
Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Mitella nuda	(common mitrewort)
Chimaphila umbellata	(prince's pine)
Gymnocarpium dryopteris	(oak fern)
Rubus pubescens	(trailing raspberry)

Moss Layer: 50% cover

Rhytidiadelphus triquetrus	(electrified cat's tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Brachythecium spp.	(ragged mosses)
Mnium spp.	(leafy mosses)

SOIL AND SITE:

Moisture Regime:	6 (hygric)
Nutrient Regime:	B-D (poor-rich)
* Slope Gradient (%):	0
* Slope Position:	level
Parent Material:	glaciofluvial and lacustrine
Soil Texture:	medium to fine
Coarse Fragments (%):	0

COMMENTS: restricted to localized shallow depression with very poor drainage

DISTRIBUTION: uncommon and small

SBSmh/09 Sxw – HORSETAIL – GLOW MOSS

INTERPRETATIONS

Site limitations:
- very difficult sites to reforest; ***seriously consider managing these sites as wildlife corridors.***
- sites within this unit have saturated soils that are poorly aerated, slowing root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1
- avoid creating an excessive number of mounds (e.g., >300/ha), especially on sites within this unit with a water table <30 cm from the surface.

Species choice:
- ***Sx, [Bl]***

Vegetation potential:
- medium (black twinberry, fireweed, bluejoint)

Reforestation:
- preserve advance regeneration.
- supplement advance regeneration by planting sturdy stock in groups, using available raised microsites.
- consider reducing inter-tree spacing to take advantage of available raised microsites.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.
- maintain Ac component.

Concerns:
- site conditions may lead to frost damage of Sx and Bl regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or preserving advance regeneration are advised.***
- these sites may represent important wildlife habitat; ***discuss prescription with wildlife personnel.***
- water table will likely rise above the ground surface in the spring, causing seedling mortality on non-elevated sites.
- this unit is critical to the control of runoff streamflow.
- sites within this unit with thick organic horizons (>10 cm) will have an extreme windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***

7 MOIST WARM SUB-BOREAL SPRUCE (SBSmw)

Subzone Summary

Location
The SBSmw occurs from around Red Rock south and east to the southern boundary of the Prince George Forest Region in the Ahbau Creek area. The subzone is bordered by the SBSmh and SBSdw1 on its western boundary, by the SBSmk1 to the north and east, and by the SBSwk1 on to the east. This subzone extends well into the Cariboo Forest Region.

Elevation range
700–1050 m

Climate
Climate data are largely lacking for this subzone, although growing season and yearly precipitation are expected to be similar to the SBSmh, and greater than the surrounding dry warm variants. Snow accumulations are greater in the SBSmw than in the SBSmh.

Distinguishing the SBSmw from adjoining biogeoclimatic units
SBSdw1 has:
- less queen's cup and little or no rosy twistedstalk on mesic sites; and
- pinegrass on xeric to subhygric sites.

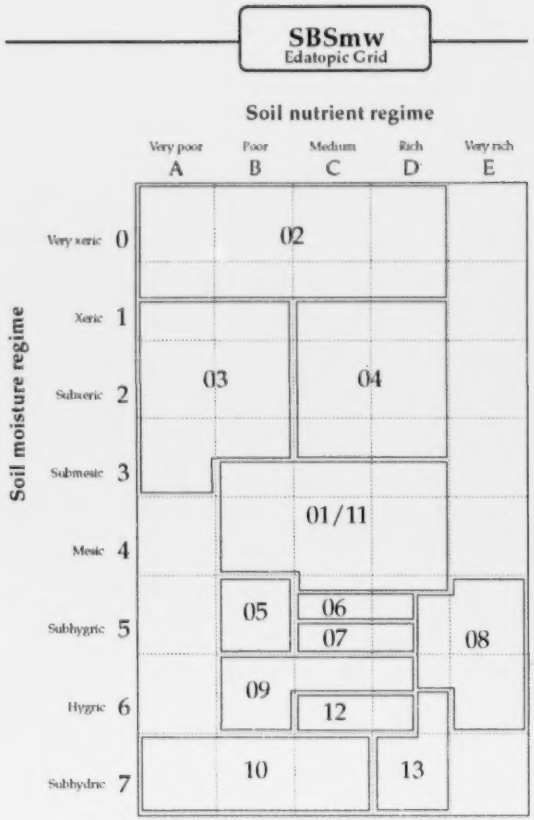
SBSmh has:
- beaked hazelnut present on mesic sites;
- soopolallie present, but no black huckleberry on xeric to submesic sites; and
- little or no foamflower on subhygric and hygric sites.

SBSmk1 has:
- less Douglas-fir on mesic sites and none on xeric sites;
- more black huckleberry on mesic sites; and
- some oak fern on mesic sites.

SBSwk1 has:
- little or no Douglas-fir on mesic sites;
- more black twinberry on mesic sites; and
- oak fern on mesic sites.

Forests

The forests of the SBSmw are a mixture of hybrid white spruce, subalpine fir, lodgepole pine, and Douglas-fir, with drier sites dominated by Douglas-fir or lodgepole pine and wetter sites by hybrid white spruce. Hybrid white spruce and subalpine fir are common on most sites, even the driest. Black spruce is prevalent in bogs and fens.



01 SxwFd – Falsebox
02 FdBl – Huckleberry
03 Pl – Huckleberry –Velvet-leaved blueberry
04 SxwFd – Knight's plume
05 Sxw – Pink spirea
06 Sxw – Oak fern
06 Sxw – Oak fern
07 Sxw – Twinberry - Oak fern
08 Sxw – Devil's club
09 Sxw – Horsetail
10 SbSxw – Scrub birch – Sedge
11 Pl – Huckleberry – Knight's plume*
12 Sxw – Pink spirea – Sphagnum*
13 Sxw – Mountain alder – Lady fern*

* Not known to occur in guide area.
Not included in key, vegetation table, or site series descriptions.
See supplement to LMH 39 (SBSmw) at
http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh39.htm

FIGURE 7.1 *Edatopic grid displaying site units of the SBSmw subzone.*

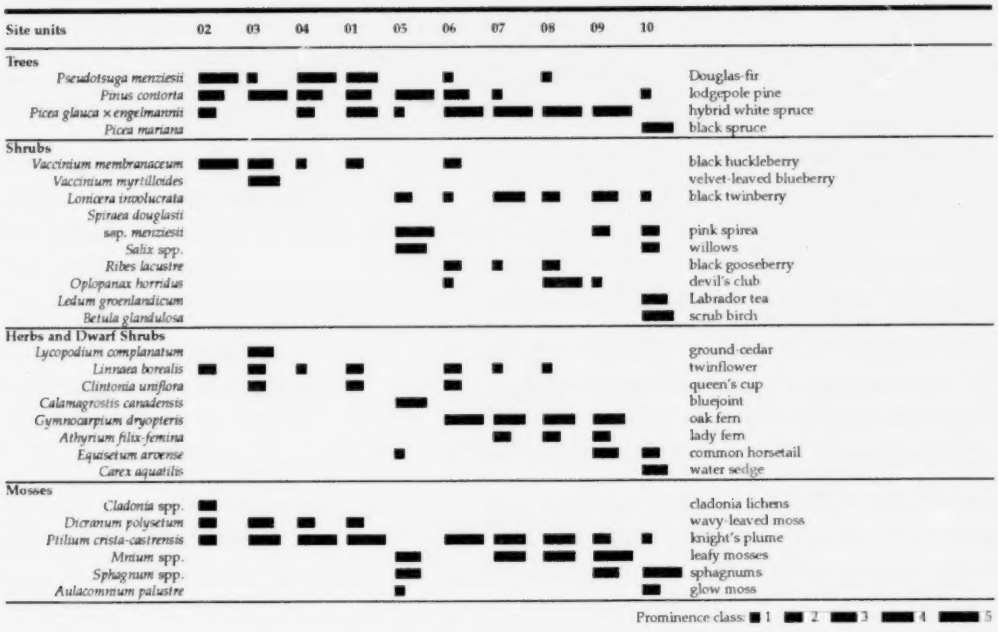


FIGURE 7.2 *SBSmw vegetation table.*

Site Series Key

1a Soils shallow, <50 cm deep; no seepage inputs; generally crest or upper slope position; bedrock outcrops generally present.

2a Soils extremely shallow, usually <20 cm deep; xeric moisture regime; *Cladonia* spp. (cladonia lichens) (p. 331–334)[1] and *Cladina* spp. (reindeer lichens) (p. 334) moderate cover (>2%).

SBSmw/02

2b Soils usually 20–50 cm deep; subxeric to submesic; *Cladonia* spp. and *Cladina* spp. low cover (<2%) or absent.

SBSmw/04

1b Soils >50 cm deep; seepage variable; slope position variable; bedrock outcrops usually not present.

3a Sandy soils (loamy sand to sand); usually fluvial or glaciofluvial; no significant seepage inputs.

4a *Vaccinium myrtilloides* (velvet-leaved blueberry) (p. 43) moderate to high cover (5–50%); *Gymnocarpium dryopteris* (oak fern) (p. 293) low cover (<1%) or absent.

SBSmw/03

4b *Vaccinium myrtilloides* low cover (<1%) or absent; *Gymnocarpium dryopteris* high cover (10–50%).

SBSmw/06

3b Loamy, silty, or clayey soils; variable parent materials; variable seepage inputs.

5a Slope 45–90% with SW, or W aspect (210–270°).

SBSmw/04

5b Slope usually <30% or aspect variable.

6a Submesic to subhygric; little or no seepage inputs.

7a *Oplopanax horridus* (devil's club) (p. 36) low cover or absent (<5%); upper slope position; colluvial parent material.

8a *Gymnocarpium dryopteris* low to moderate cover (<10%); submesic to mesic.

SBSmw/01

8b *Gymnocarpium dryopteris* high cover (>10%); subhygric.

SBSmw/06

[1] Page numbers refer to the publication *Plants of Northern British Columbia* (MacKinnon et al. [editors] 1992).

7b *Oplopanax horridus* moderate to high cover (>5%); lower to toe slopes, or depressional; usually north-facing; morainal, lacustrine, and fluvial parent materials.

SBSmw/08

6b Subhygric to subhydric; significant seepage inputs.

9a Subhygric; no permanent water table within 50 cm of soil surface; temporary water table may be present in spring; middle, lower, toe, or level slope position.

10a *Spiraea douglasii* ssp. *menziesii* (pink spirea) (p. 45) and *Calamagrostis canadensis* (bluejoint) (p. 239) high cover (>10%).

SBSmw/05

10b *Spiraea douglasii* ssp. *menziesii* and *Calamagrostis canadensis* low cover (<2%) or absent.

11a *Oplopanax horridus* low cover (<5%); *Lonicera involucrata* (black twinberry) (p. 48) moderate to high cover (>5%).

SBSmw/07

11b *Oplopanax horridus* moderate to high cover (>5%); *Lonicera involucrata* low to moderate cover (<5%).

SBSmw/08

9b Hygric to subhydric; permanent water table within 50 cm of soil surface; generally toe slopes or depressions.

12a *Oplopanax horridus* moderate to high cover (>5%); drainage channels and streambanks; usually sandy or silty fluvial materials.

SBSmw/08

12b *Oplopanax horridus* low cover (<5%) or absent.

13a Surface organic horizon <50 cm thick over mineral soil; *Equisetum* spp. (horsetails) (p. 281–283) moderate to high cover (>5%); *Sphagnum* spp. (sphagnums) (p. 312–314) low cover (<2%) or absent.

SBSmw/09

13b Surface organic horizon >50 cm thick over mineral soil; *Equisetum* spp. low cover (<5%); *Sphagnum* spp. high cover (>10%).

SBSmw/10

NOTES

SBSmw/01 SxwFd – FALSEBOX

Paxistima myrsinites

VEGETATION

Tree Layer: 45% cover

Douglas-fir, hybrid white spruce, lodgepole pine, subalpine fir

Shrub Layer: 30% cover

Spiraea betulifolia	(birch-leaved spirea)
Vaccinium membranaceum	(black huckleberry)
Rubus parviflorus	(thimbleberry)
Viburnum edule	(highbush-cranberry)
Rosa acicularis	(prickly rose)
Amelanchier alnifolia	(saskatoon)
Paxistima myrsinites	(falsebox)
subalpine fir	
hybrid white spruce	

Spiraea betulifolia

Herb Layer: 30% cover

Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Clintonia uniflora	(queen's cup)
Aralia nudicaulis	(wild sarsaparilla)
Smilacina racemosa	(false Solomon's-seal)
Arnica cordifolia	(heart-leaved arnica)
Orthilia secunda	(one-sided wintergreen)
Chimaphila umbellata	(prince's pine)
Aster conspicuus	(showy aster)

Moss Layer: 80% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Hylocomium splendens	(step moss)
Dicranum polysetum	(wavy-leaved moss)

Cornus canadensis

SOIL AND SITE:

Moisture Regime:	3–4 (submesic-mesic)
Nutrient Regime:	B-D (poor-rich)
* Slope Gradient (%):	0–75, usually <20
Slope Position:	variable; usually mid
* Parent Material:	variable; usually morainal
Soil Texture:	variable
Coarse Fragments (%):	32 (0–77)

DISTRIBUTION: very common and often large

SBSmw/01 **SxwFd – FALSEBOX**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Silvicultural system:
- assess partial cutting feasibility if Fd is present.

Site preparation:
- see Section 12.1

Species choice:
- Fd, Pl, Sx, [Bl]

Vegetation potential:
- moderate (black twinberry, thimbleberry, fireweed)

Reforestation:
- attempt to preserve advance Fd regeneration when partial cutting.
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- help maintain stand diversity on sites to be planted with Pl by mapping aspen patches prior to harvest and planting these areas with spruce.

Concerns:
- sites within this unit with coarse-textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***
- sites with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- sites within this unit with silty soils are susceptible to frost heaving; ***avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.***

SBSmw/02 FdBl – HUCKLEBERRY

Vaccinium membranaceum

VEGETATION

Tree Layer: 35% cover
Douglas-fir, subalpine fir, lodgepole pine, hybrid white spruce

Shrub Layer: 35% cover

Vaccinium membranaceum	(black huckleberry)
Paxistima myrsinites	(falsebox)
Amelanchier alnifolia	(saskatoon)
Sorbus scopulina	(western mountain-ash)
Spiraea betulifolia	(birch-leaved spirea)
subalpine fir	
Douglas-fir	

Herb Layer: 15% cover

Linnaea borealis	(twinflower)
Goodyera oblongifolia	(rattlesnake-plantain)
Festuca occidentalis	(western fescue)
[*Moneses uniflora*	(single delight)]

Moss Layer: 75% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Polytrichum juniperinum	(juniper haircap moss)
Peltigera aphthosa	(freckle lichen)
Peltigera malacea	(apple pelt)
Dicranum spp.	(crane's-bill mosses)
Cladonia spp.	(cladonia lichens)
[*Dicranum scoparium*	(broom moss)]

Linnaea borealis

SOIL AND SITE:

Moisture Regime:	1 (xeric)
Nutrient Regime:	A-C (very poor-medium)
Slope Gradient (%):	3 (0–10)
* Slope Position:	upper to crest
* Parent Material:	morainal veneer over rock
* Soil Texture:	moderately coarse to coarse
* Coarse Fragments (%):	63 (55–75)
* Soil Depth:	generally <20 cm

COMMENTS: restricted to thin soils on hill tops, ridges and upper slopes

DISTRIBUTION: common and small

Polytrichum juniperinum

SBSmw/02 **FdBl – HUCKLEBERRY**

INTERPRETATIONS

Site limitations:
- site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***

Silvicultural system:
- avoid clearcutting; stand re-establishment will be difficult because of high surface soil temperatures and drought.
- leave enough stems to provide shade to the site.

Site preparation:
- avoid site preparation for planting.
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Fd, Pl, (***Bl, Sx***)

Vegetation potential:
- low

Reforestation:
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- attempt to preserve advance Fd regeneration when partial cutting.
- fill planting may be required after partial cutting.

Concerns:
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***leaving a shelterwood overstorey can reduce tree seedling moisture stress.***
- these sites may represent important early season range for wildlife; ***discuss management prescriptions with wildlife personnel.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***

SBSmw/03 Pl – HUCKLEBERRY – VELVET-LEAVED BLUEBERRY

Vaccinium myrtilloides

VEGETATION

Tree Layer: 25% cover
lodgepole pine, subalpine fir, [hybrid white spruce]

Shrub Layer: 40% cover

Vaccinium myrtilloides	(velvet-leaved blue berry)
Spiraea betulifolia	(birch-leaved spirea)
Amelanchier alnifolia	(saskatoon)
Vaccinium membranaceum	(black huckleberry)
[*Rosa acicularis*	(prickly rose)]

subalpine fir
hybrid white spruce

Herb Layer: 30% cover

Cornus canadensis	(bunchberry)
Chimaphila umbellata	(prince's pine)
Linnaea borealis	(twinflower)
Goodyera oblongifolia	(rattlesnake-plantain)
Lycopodium complanatum	(ground-cedar)
Geocaulon lividum	(bastard toad-flax)
Clintonia uniflora	(queen's cup)
Gaultheria hispidula	(creeping-snowberry)
Epilobium angustifolium	(fireweed)

Cornus canadensis

Moss Layer: 90% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Hylocomium splendens	(step moss)
Dicranum polysetum	(wavy-leaved moss)
Peltigera aphthosa	(freckle pelt)

SOIL AND SITE:

Moisture Regime:	1–3 (xeric-submesic)
Nutrient Regime:	A-B (very poor-poor)
* Slope Gradient (%):	0 (0–2)
* Slope Position:	level
Parent Material:	(glacio)fluvial
* Soil Texture:	coarse
* Coarse Fragments (%):	68 (50–80)

Linnaea borealis

COMMENTS: occurs on dry sandy level fluvial soils

DISTRIBUTION: common

SBSmw/03 Pl - HUCKLEBERRY - VELVET-LEAVED BLUEBERRY

INTERPRETATIONS

Site limitations:	- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones.***
Silvicultural system:	- minimize or align large slash accumulations when logging to help meet site preparation objectives and reduce fire hazard.
Site preparation:	- light scarification for seedbed preparation or summer logging with no site preparation.
Species choice:	- Pl, ***Fd, (Bl, Sx)***
Vegetation potential:	- low
Reforestation:	- attempt to regenerate naturally or, if not possible, plant Pl.
Concerns:	- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
	- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.***
	- sites within this unit are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***
	- dwarf mistletoe may cause significant damage to planted or advance regeneration pine, especially where mature pine are maintained in the overstorey.

SBSmw/04 SxwFd – KNIGHT'S PLUME

Paxistima myrsinites

VEGETATION

Tree Layer: 45% cover

Douglas-fir, lodgepole pine, hybrid white spruce, subalpine fir

Shrub Layer: 20% cover

Paxistima myrsinites	(falsebox)
Vaccinium membranaceum	(black huckleberry)
Amelanchier alnifolia	(saskatoon)
Rosa acicularis	(prickly rose)
Acer glabrum	(Douglas maple)
[*Spiraea betulifolia*	(birch-leaved spirea)]
subalpine fir	

Herb Layer: 15% cover

Linnaea borealis	(twinflower)
Aralia nudicaulis	(wild sarsaparilla)
Chimaphila umbellata	(prince's pine)
Goodyera oblongifolia	(rattlesnake-plantain)
Smilacina racemosa	(false Solomon's-seal)

Vaccinium membranaceum

Moss Layer: 70% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Peltigera aphthosa	(freckle lichen)
Dicranum polysetum	(wavy-leaved moss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Hylocomium splendens	(step moss)

SOIL AND SITE:

Moisture Regime:	1–3 (xeric-submesic)
Nutrient Regime:	B-C (poor-medium)
Slope Gradient (%):	(0–90)
* Slope Position:	upper or crest
* Slope Aspect:	southerly (210–270°) if soils >50 cm deep
* Parent Material:	usually colluvial veneer over bedrock, also morainal
Soil Texture:	medium to coarse
* Coarse Fragments (%):	65 (15–90); usually >50

Smilacina racemosa

COMMENTS: restricted to southerly aspects on deeper soils

DISTRIBUTION: uncommon and small

SBSmw/04 **SxwFd – KNIGHT'S PLUME**

INTERPRETATIONS

Site limitations:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***

Silvicultural system:
- avoid clearcutting on driest sites; stand re-establishment will be difficult because of high surface soil temperatures and drought.
- leave enough stems to provide shade to the site.

Site preparation:
- avoid site preparation for planting.
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Fd, Pl, ***Sx, [Bl]***

Vegetation potential:
- low

Reforestation:
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- attempt to preserve advance Fd regeneration when partial cutting.

Concerns:
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***leaving a shelterwood overstorey can reduce tree seedling moisture stress.***
- these sites may represent important early season range for wildlife; ***discuss management prescriptions with wildlife personnel.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- dwarf mistletoe may cause significant damage to planted or advance regeneration pine, especially where mature pine are maintained in the overstorey.

SBSmw/05 Sxw – PINK SPIREA

Spiraea douglasii

VEGETATION

Tree Layer: 25% cover
lodgepole pine, hybrid white spruce, trembling aspen

Shrub Layer: 80% cover

Spiraea douglasii ssp. *menziesii*	(pink spirea)
Salix spp.	(willows)
Lonicera involucrata	(black twinberry)
Alnus incana ssp. *tenuifolia*	(mountain alder)
Cornus stolonifera	(red-osier dogwood)
Rosa acicularis	(prickly rose)

hybrid white spruce

Calamagrostis canadensis

Herb Layer: 35% cover

Calamagrostis canadensis	(bluejoint)
Aster modestus	(great northern aster)
Pyrola asarifolia	(pink wintergreen)
Rubus pubescens	(trailing raspberry)
Equisetum arvense	(common horsetail)
Fragaria virginiana	(wild strawberry)
Cornus canadensis	(bunchberry)

Moss Layer: 25% cover

Sphagnum capillaceum	(common red sphagnum)
Mnium spp.	(leafy mosses)
Pleurozium schreberi	(red-stemmed feathermoss)
Brachythecium spp.	(ragged mosses)
Aulacomnium palustre	(glow moss)

Sphagnum capillaceum

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	B (poor)
Slope Gradient (%):	<5
* Slope Position:	level
* Parent Material:	fluvial veneer over morainal blanket or morainal blanket
* Soil Texture:	moderately fine to fine
Coarse Fragments (%):	(20–65)

COMMENTS: associated with areas of cold air accumulation

DISTRIBUTION: locally common

SBSmw/05 **Sxw – PINK SPIREA**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Site preparation:
- see Section 12.1
- avoid mechanical site preparation when clay-textured soils occur up to the surface.

Species choice:
- Pl, ***Sx, [Bl]***

Vegetation potential:
- moderate (black twinberry, pink spirea, bluejoint)

Reforestation:
- a combination of poorly structured soils and frost makes these sites difficult to regenerate, so preserve any good quality advance regeneration during harvesting.
- supplement advance regeneration by planting sturdy stock in groups on available raised microsites.
- help maintain stand diversity on sites to be planted with Pl by mapping aspen patches prior to harvest and planting these areas with spruce.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- sites within this unit with fine-textured soils are very vulnerable to compaction under wet conditions; ***restrict traffic to winter operations.***
- site conditions may lead to frost damage of Sx regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***
- sites within this unit with silty soils are susceptible to frost heaving; ***bareroot stock will likely resist frost heaving better than plug stock.***

SBSmw/06 Sxw – OAK FERN

Ribes lacustre

VEGETATION

Tree Layer: 55% cover
hybrid white spruce, subalpine fir, lodgepole pine

Shrub Layer: 30% cover

Ribes lacustre	(black gooseberry)
Spiraea betulifolia	(birch-leaved spirea)
Lonicera involucrata	(black twinberry)
Rosa acicularis	(prickly rose)
Vaccinium membranaceum	(black huckleberry)
Rubus parviflorus	(thimbleberry)
Viburnum edule	(highbush-cranberry)

subalpine fir
hybrid white spruce

Gymnocarpium dryopteris

Herb Layer: 60% cover

Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Rubus pedatus	(five-leaved bramble)
Lycopodium annotinum	(stiff clubmoss)
Linnaea borealis	(twinflower)
Streptopus roseus	(rosy twistedstalk)
Clintonia uniflora	(queen's cup)
Tiarella trifoliata	(foamflower)
Aralia nudicaulis	(wild sarsaparilla)
Orthilia secunda	(one-sided wintergreen)
Streptopus amplexifolius	(clasping twistedstalk)

Moss Layer: 80% cover

Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)

Lycopodium annotinum

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	B-D (poor-rich)
* Slope Gradient (%):	6 (0–18)
* Slope Position:	usually lower or level (or mid with N aspect)
Parent Material:	morainal or fluvial
Soil Texture:	medium to coarse
Coarse Fragments (%):	42 (10–65)

DISTRIBUTION: common and widely distributed

SBSmw/06 **Sxw – OAK FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Site preparation:
- see Section 12.1
- sites with thick organic horizons (>10 cm) reduce spring soil temperatures, slowing root development; ***attempt to reduce organic horizon thickness during site preparation.***

Species choice:
- Pl, Sx, ***Fd, [Bl]***

Vegetation potential:
- moderate – high (black twinberry, thimbleberry, fireweed)

Reforestation:
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- plant sturdy stock as soon after harvesting as possible.
- avoid planting of Sx or Fd in obvious frost pockets unless cover is provided.

Concerns:
- sites within this unit with silty soils are susceptible to frost heaving; ***avoid exposing mineral soil and plant early in season, when conditions are moist, to encourage root egress.***
- Warren's root collar weevil can cause mortality in young stands, especially where duff layers are thick.
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

SBSmw/07 Sxw – TWINBERRY – OAK FERN

Lonicera involucrata

VEGETATION

Tree Layer: 50% cover
hybrid white spruce, subalpine fir, [lodgepole pine]

Shrub Layer: 25% cover

Lonicera involucrata	(black twinberry)
Viburnum edule	(highbush-cranberry)
Ribes lacustre	(black gooseberry)
Rubus parviflorus	(thimbleberry)
Cornus stolonifera	(red-osier dogwood)
Rosa acicularis	(prickly rose)
subalpine fir	

Herb Layer: 50% cover

Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Smilacina racemosa	(false Solomon's-seal)
Gymnocarpium dryopteris	(oak fern)
Athyrium filix-femina	(lady fern)
Aralia nudicaulis	(wild sarsaparilla)
Tiarella trifoliata	(foamflower)
Rubus pedatus	(five-leaved bramble)
Equisetum arvense	(common horsetail)
[*Streptopus roseus*	(rosy twistedstalk)]

Gymnocarpium dryopteris

Moss Layer: 50% cover

Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
Mnium spp.	(leafy mosses)
Hylocomium splendens	(step moss)

Rhytidiadelphus triquetrus

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	C–D (medium-rich)
* Slope Gradient (%):	8 (0–24)
* Slope Position:	lower to toe
Parent Material:	morainal and fluvial
Soil Texture:	variable
Coarse Fragments (%):	0–85

COMMENTS: associated with areas of cold air accumulation

DISTRIBUTION: common

SBSmw/07 **Sxw – TWINBERRY – OAK FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit may be subject to periodic flooding; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1

Species choice:
- ***Bl, [Pl, Sx]***

Vegetation potential:
- moderate to high (black twinberry, thimbleberry, fireweed)

Reforestation:
- if feasible, preserve vigorous Sx regeneration.
- plant sturdy stock as soon after harvesting as possible.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- sites within this unit with silty soils are susceptible to frost heaving; ***bareroot stock will likely resist frost heaving better than plug stock.***
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***

SBSmw/08 Sxw – DEVIL'S CLUB

Oplopanax horridus

VEGETATION

Tree Layer: 50% cover
hybrid white spruce, subalpine fir

Shrub Layer: 50% cover

Oplopanax horridus	(devil's club)
Ribes lacustre	(black gooseberry)
Lonicera involucrata	(black twinberry)
Viburnum edule	(highbush-cranberry)
Rubus parviflorus	(thimbleberry)
Rubus idaeus	(red raspberry)
Cornus stolonifera	(red-osier dogwood)

subalpine fir

Herb Layer: 50% cover

Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Athyrium filix-femina	(lady fern)
Tiarella trifoliata	(foamflower)
Streptopus amplexifolius	(clasping twistedstalk)
Rubus pubescens	(trailing raspberry)
Smilacina racemosa	(false Solomon's-seal)
Circaea alpina	(enchanter's nightshade)
Dryopteris expansa	(spiny wood fern)
Lycopodium annotinum	(stiff clubmoss)
Linnaea borealis	(twinflower)

Gymnocarpium dryopteris

Moss Layer: 70% cover

Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Ptilium crista-castrensis	(knight's plume)
Mnium spp.	(leafy mosses)
Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Brachythecium spp.	(ragged mosses)

Rhytidiadelphus triquetrus

SOIL AND SITE:

Moisture Regime:	5–6 (subhygric-hygric)
Nutrient Regime:	D–E (rich-very rich)
Slope Gradient (%):	20 (5–70)
* Slope Position:	lower to toe
Parent Material:	morainal, lacustrine, fluvial
Soil Texture:	variable
Coarse Fragments (%):	33 (0–70)

DISTRIBUTION: common

SBSmw/08 **Sxw – DEVIL'S CLUB**

INTERPRETATIONS

Site limitations:
- sites with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***
- sites with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated) or protect advance regeneration.***

Site preparation:
- see Section 12.1

Species choice:
- ***Fd, Sx,*** [***Bl,*** Pl]

Vegetation potential:
- very high (black twinberry, thimbleberry, red raspberry, fireweed)

Reforestation:
- preserve vigorous advance regeneration.
- plant sturdy stock immediately after harvesting.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.
- due to the very high level of competition on theses sites, it will be difficult to successfully regenerate them to Pl without high site treatment costs.

Concerns:
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- sites within this unit with silty soils are susceptible to frost heaving; ***bareroot stock will likely resist frost heaving better than plug stock.***
- sites within this unit with thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***

SBSmw/09 Sxw – HORSETAIL

Alnus incana ssp. *tenuifolia*

Equisetum arvense

Mnium spp.

VEGETATION

Tree Layer: 35% cover
hybrid white spruce, subalpine fir

Shrub Layer: 35% cover

Alnus incana ssp. *tenuifolia*	(mountain alder)
Viburnum edule	(highbush-cranberry)
Spiraea douglasii spp. *menziesii*	(pink spirea)
Lonicera involucrata	(black twinberry)
subalpine fir	

Herb Layer: 70% cover

Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Equisetum arvense	(common horsetail)
Equisetum sylvaticum	(wood horsetail)
Mitella nuda	(common mitrewort)
Athyrium filix-femina	(lady fern)
Rubus pedatus	(five-leaved bramble)
Circaea alpina	(enchanter's nightshade)
Galium triflorum	(sweet-scented bedstraw)
Aster modestus	(great northern aster)

Moss Layer: 75% cover

Mnium spp.	(leafy mosses)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
Brachythecium spp.	(ragged mosses)

SOIL AND SITE:

Moisture Regime:	6 (hygric)
Nutrient Regime:	B-D (poor-rich)
* Slope Gradient (%):	2 (0–6)
* Slope Position:	depression to toe
* Parent Material:	fluvial; some organic veneers
Soil Texture:	medium to moderately coarse
Coarse Fragments (%):	0–50; often 0

COMMENTS: associated with watercourses

DISTRIBUTION: uncommon

SBSmw/09 **Sxw – HORSETAIL**

INTERPRETATIONS

Site limitations:
- very difficult sites to reforest; ***consider managing these sites primarily as wildlife habitat.***
- sites with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1
- carefully assess plantable and preparable raised microsites to determine target stocking levels.
- avoid creating an excessive number of microsites (e.g., >300/ha), especially on sites within this unit with a water table <30 cm from the surface.

Species choice:
- ***Sx, [Bl, Pl]***

Vegetation potential:
- moderate (black twinberry, fireweed, bluejoint)

Reforestation:
- preserve advance regeneration.
- supplement advance regeneration by planting sturdy stock in groups, using available raised microsites.
- consider reducing inter-tree spacing to take advantage of available raised microsites.

Concerns:
- site conditions leading to cold air ponding will lead to frost damage of Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***
- these sites may represent important wildlife habitat; ***discuss prescription with wildlife personnel.***
- water table will likely rise above the ground surface in the spring, causing seedling mortality on non-elevated sites.
- this unit is critical to the control of runoff streamflow.
- sites within this unit with thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***

SBSmw/10 SbSxw – SCRUB BIRCH – SEDGE

Betula glandulosa

Ledum groenlandicum

Oxycoccus oxycoccos

VEGETATION

Tree Layer: 15% cover
black spruce, [lodgepole pine, hybrid white spruce]

Shrub Layer: 40% cover

Betula glandulosa	(scrub birch)
Ledum groenlandicum	(Labrador tea)
Salix spp.	(willows)
[*Spiraea douglasii* ssp. *menziesii*	(pink spirea)]
[*Lonicera involucrata*	(black twinberry)]
[black spruce]	

Herb Layer: 40% cover

Oxycoccus oxycoccos	(bog cranberry)
Carex spp.	(sedges)
Gaultheria hispidula	(creeping snowberry)
Equisetum arvense	(common horsetail)
Cornus canadensis	(bunchberry)
Potentilla palustris	(marsh cinquefoil)

Moss Layer: 85% cover

Sphagnum spp.	(sphagnum mosses)
Aulacomnium palustre	(glow moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Tomenthypnum nitens	(golden fuzzy fen moss)
Ptilium crista-castrensis	(knight's plume)
Hylocomium splendens	(step moss)

SOIL AND SITE:

Moisture Regime:	7 (subhydric)
Nutrient Regime:	A-C (very poor-medium)
Slope Gradient (%):	0–2
* Slope Position:	depression or level
* Parent Material:	organic
* Soil Texture:	organic
* Coarse Fragments (%):	0

DISTRIBUTION: common

SBSmw/10 SbSxw – SCRUB BIRCH – SEDGE

INTERPRETATIONS

Site limitations: – site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***

Silvicultural system: – avoid logging.

8 VERY WET COOL SUB-BOREAL SPRUCE (SBSvk)

Subzone Summary

Location
The SBSvk occupies the south-central portion of the Bowron Valley and tributary valleys, lower elevations of the McGregor Plateau, and the valleys along the western side of the Rocky Mountains north to Williston Lake. It is bordered at lower elevations and to the west and south by the SBSwk1, except in the Williston reservoir area where it is bordered at lower elevations by the SBSwk2 and the SBSmk2; on higher slopes in the Fraser River, Torpy River, and upper McGregor River valleys by the ICHvk2; at higher elevations by the ESSFwk1 in the Bowron Valley and tributary valleys; and by the ESSFwk2 in the Rocky Mountains and the McGregor Plateau.

Elevation range
615–1150 m

Climate
The SBSvk is the wettest biogeoclimatic unit in the guide area, with the highest annual precipitation and the highest growing season precipitation (see Table 4.1). Data for snowfall are unavailable. Within the guide area this unit has the lowest mean annual temperature of the SBS units; only the ESSF is colder.

Distinguishing the SBSvk from adjoining biogeoclimatic units
SBSmk2 has:
- mesic sites dominated by a mixture of lodgepole pine and hybrid white spruce;
- very little devil's club on mesic sites; and
- more soopolallie on submesic and mesic sites.

SBSwk1 has:
- more lodgepole pine on mesic and submesic sites;
- little or no devil's club on submesic sites; and
- less Indian hellebore and spiny wood fern on mesic sites.

SBSwk2 has:
- more lodgepole pine on mesic and submesic sites;
- little or no devil's club on submesic sites; and
- less Indian hellebore and spiny wood fern on mesic sites.

ICHvk2 has:
- more western hemlock and western redcedar across all sites; and
- less black huckleberry on mesic and submesic sites.

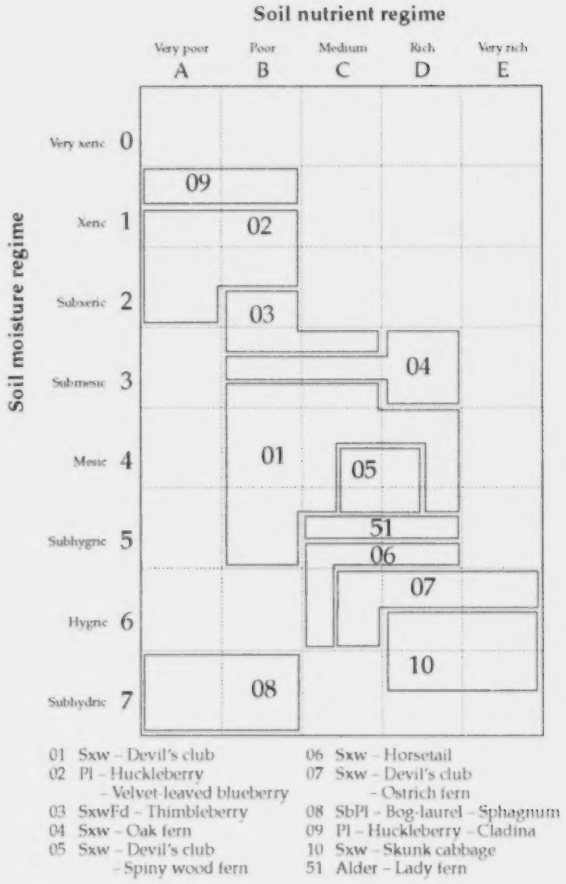
ESSFwk1 has:
- white-flowered rhododendron on nearly all sites; and
- less lady fern on mesic and subhygric sites.

ESSFwk2 has:
- white-flowered rhododendron on nearly all sites; and
- devil's club only on subhygric sites.

Forests

Forests of the SBSvk are predominantly a mix of hybrid white spruce and subalpine fir, with lodgepole pine dominating the driest and the wettest sites. Douglas-fir occurs on dry sites only, while black spruce is found with lodgepole pine in bogs. Paper birch and western hemlock are minor components of the tree canopy.

SBSvk
Edatopic Grid



01 Sxw – Devil's club
02 Pl – Huckleberry
– Velvet-leaved blueberry
03 SxwFd – Thimbleberry
04 Sxw – Oak fern
05 Sxw – Devil's club
– Spiny wood fern
06 Sxw – Horsetail
07 Sxw – Devil's club
– Ostrich fern
08 SbPl – Bog-laurel – Sphagnum
09 Pl – Huckleberry – Cladina
10 Sxw – Skunk cabbage
51 Alder – Lady fern

FIGURE 8.1 *Edatopic grid displaying site units of the SBSvk subzone.*

FIGURE 8.2 *SBSvk vegetation table.*

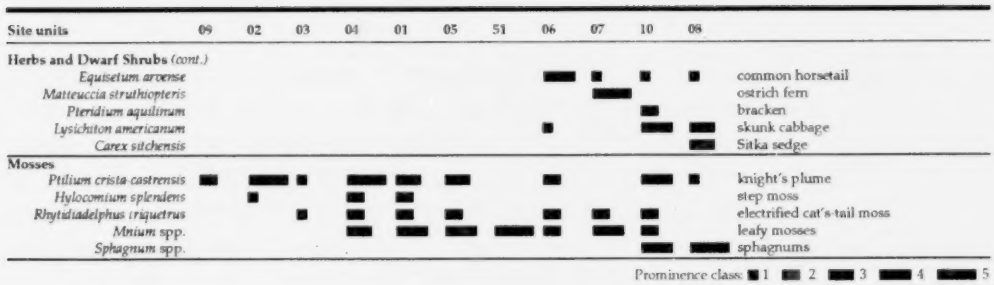


FIGURE 8.2 *Continued.*

Site Series Key

1a Trees absent but *Alnus viridis* (alder) (p. 37)[1] abundant; generally on seepage slopes.

SBSvk/51

1b Hybrid white spruce, lodgepole pine, or Douglas-fir present in the main canopy.

2a Canopy dominated by Douglas-fir.

SBSvk/03

2b Canopy dominated by hybrid white spruce, subalpine fir, black spruce, or lodgepole pine.

3a Canopy dominated by lodgepole pine or black spruce.

4a Water table present within 50 cm of soil surface; *Ledum groenlandicum* (Labrador tea) (p. 40) moderate to high cover (>5%); level with 0% coarse fragments.

SBSvk/08

4b Water table absent within 50 cm of soil surface; *Ledum groenlandicum* absent; slope position and % coarse fragments variable.

5a *Vaccinium myrtilloides* (velvet-leaved blueberry) (p. 43) high cover (usually >10%); Douglas-fir absent; on coarse-textured fluvial material.

SBSvk/02

5b *Vaccinium myrtilloides* low cover (<1%) or absent; Douglas-fir may be present; medium- to coarse-textured colluvial and morainal veneers.

SBSvk/09

3b Canopy dominated by hybrid white spruce or a combination of spruce and subalpine fir.

6a Level (<5% slope) or >5% slope and associated with narrow drainage channels.

7a *Lysichiton americanum* (skunk cabbage) (p. 224) high cover (>10%); moss layer dominated by *Sphagnum* spp. (sphagnums) (p. 312–314).

SBSvk/10

7b *Lysichiton americanum* absent; moss layer not dominated by *Sphagnum* spp.

[1] Page numbers refer to the publication *Plants of Northern British Columbia* (MacKinnon et al. [editors] 1992).

8a Seepage water present; site adjacent to water or in depression; *Equisetum* spp. (horsetails) (p. 281–284) or *Athyrium filix-femina* (lady fern) (p. 291) moderate to high cover (>2%).

9a *Equisetum* spp. usually high cover (>10%).

SBSvk/06

9b *Equisetum* spp. low cover (<5%) or absent.

SBSvk/07

8b Seepage water absent; upland site; *Equisetum* spp. low cover (<1%) or absent; *Athyrium filix-femina* cover highly variable.

10a *Dryopteris expansa* (spiny wood fern) (p. 292) or *Athyrium filix-femina* high cover (>10%); mottles generally present at depth; generally moderately fine-textured soil.

SBSvk/05

10b *Dryopteris expansa* and *Athyrium filix-femina* low cover (<1%) or absent; mottles absent; generally moderately coarse-textured soil.

SBSvk/04

6b Sloping (>5% slope) and not associated with narrow drainage channels.

11a *Oplopanax horridus* high cover (>10%; often >25%); aspect variable; moderate to deep soils (>30 cm); soil texture variable.

SBSvk/01

11b *Oplopanax horridus* low cover (<10%) or absent; aspect usually westerly; soils shallow to bedrock, or if not, then coarse-textured.

SBSvk/04

SBSvk/01 Sxw – DEVIL'S CLUB

Oplopanax horridus

VEGETATION

Tree Layer: 25% cover
hybrid white spruce, subalpine fir

Shrub Layer: 45% cover

Oplopanax horridus	(devil's club)
Ribes lacustre	(black gooseberry)
Rubus parviflorus	(thimbleberry)
Vaccinium membranaceum	(black huckleberry)
Lonicera involucrata	(black twinberry)
Vaccinium ovalifolium	(oval-leaved blueberry)

subalpine fir
hybrid white spruce

Herb Layer: 60% cover

Dryopteris expansa	(spiny wood fern)
Gymnocarpium dryopteris	(oak fern)
Rubus pedatus	(five-leaved bramble)
Streptopus roseus	(rosy twistedstalk)
Cornus canadensis	(bunchberry)
Athyrium filix-femina	(lady fern)
Galium triflorum	(sweet-scented bedstraw)
Tiarella trifoliata	(foamflower)
Veratrum viride	(Indian hellebore)
Streptopus amplexifolius	(clasping twistedstalk)

Dryopteris expansa

Moss Layer: 45% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
[*Mnium* spp.	(leafy mosses)]
[*Hylocomium splendens*	(step moss)]

Gymnocarpium dryopteris

SOIL AND SITE:

Moisture Regime:	3–5 (submesic-subhygric)
Nutrient Regime:	B-D (poor-rich)
Slope Gradient (%):	15 (0–67)
Slope Position:	variable
Parent Material:	variable, usually fluvial
Soil Texture:	variable
Coarse Fragments (%):	30 (0–87)

COMMENTS: a variable unit depending on aspect and moisture regime

DISTRIBUTION: very common and large

SBSvk/01 **Sxw – DEVIL'S CLUB**

INTERPRETATIONS

Site limitations:
- sites with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***
- sites with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that achieves better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Site preparation:
- see Section 12.1

Species choice:
- Sx, [Bl, ***Fd, Pl***]

Vegetation potential:
- very high (thimbleberry, red raspberry, lady fern, fireweed)

Reforestation:
- plant sturdy stock as soon after harvesting as possible.
- only plant Fd on coarse-textured soils on southerly aspects.
- Pl may be susceptible to snow damage; choose appropriate seed source.
- preserve advance regeneration where feasible.
- avoid planting Sx in obvious frost pockets unless risk can be reduced by providing cover.

Concerns:
- sites with thick organic horizons (>10 cm) reduce spring soil temperatures, slowing root development; ***attempt to reduce organic horizon thickness during site preparation.***
- sites within this unit with thick organic horizons (>10 cm) and/or shallow (<30 cm) effective rooting depth have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***

SBSvk/02 Pl – HUCKLEBERRY – VELVET-LEAVED BLUEBERRY

Vaccinium myrtilloides

VEGETATION

Tree Layer: 20% cover
lodgepole pine, subalpine fir, hybrid white spruce

Shrub Layer: 35% cover

Vaccinium myrtilloides	(velvet-leaved blueberry)
Vaccinium membranaceum	(black huckleberry)
Amelanchier alnifolia	(saskatoon)
Rosa acicularis	(prickly rose)
Sorbus scopulina	(western mountain-ash)
Lonicera involucrata	(black twinberry)
subalpine fir	
hybrid white spruce	

Herb Layer: 45% cover

Cornus canadensis	(bunchberry)
Rubus pedatus	(five-leaved bramble)
Linnaea borealis	(twinflower)
Vaccinium caespitosum	(dwarf blueberry)
Geocaulon lividum	(bastard toad-flax)
Epilobium angustifolium	(fireweed)
Gaultheria hispidula	(creeping-snowberry)
Smilacina stellata	(star-flowered false Solomon's-seal)
Calamagrostis canadensis	(bluejoint)
Oryzopsis asperifolia	(rough-leaved ricegrass)

Rubus pedatus

Moss Layer: 85% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Peltigera aphthosa	(freckle lichen)
Dicranum polysetum	(wavy-leaved moss)

Pleurozium schreberi

SOIL AND SITE:

Moisture Regime:	1–2 (xeric-subxeric)
Nutrient Regime:	A-C (very poor-medium)
* Aspect:	westerly (SW to NW) if sloping
Slope Gradient (%):	0–60 (often level)
* Slope Position:	level or crest
* Parent Material:	fluvial
* Soil Texture:	usually coarse
Coarse Fragments (%):	7–75

DISTRIBUTION: uncommon, restricted to coarse-textured fluvial terraces

SBSvk/02 Pl – HUCKLEBERRY – VELVET-LEAVED BLUEBERRY

INTERPRETATIONS

Site limitations:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones.***

Site preparation:
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Pl, (***Bl, Sx***)

Vegetation potential:
- low

Reforestation:
- attempt to regenerate naturally if potential exists.
- if natural regeneration is not feasible, plant Pl.
- Bl and Sx are significantly less productive than Pl on these sites.

Concerns:
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; distribute woody debris and cones across these sites (i.e., lop and scatter).

SBSvk/03 SxwFd – THIMBLEBERRY

Rubus parviflorus

VEGETATION

Tree Layer: 15% cover
Douglas-fir, hybrid white spruce, subalpine fir

Shrub Layer: 50% cover

Rubus parviflorus	(thimbleberry)
Acer glabrum	(Douglas maple)
Cornus stolonifera	(red-osier dogwood)
Ribes lacustre	(black gooseberry)
Viburnum edule	(highbush-cranberry)
Vaccinium membranaceum	(black huckleberry)
Oplopanax horridus	(devil's club)
subalpine fir	
hybrid white spruce	

Herb Layer: 40% cover

Streptopus roseus	(rosy twistedstalk)
Cornus canadensis	(bunchberry)
Thalictrum occidentale	(western meadowrue)
Smilacina racemosa	(false Solomon's-seal)
Aralia nudicaulis	(wild sarsaparilla)
Viola spp.	(violets)
Streptopus amplexifolius	(clasping twistedstalk)
Rubus pubescens	(trailing raspberry)

Cornus canadensis

Moss Layer: 10% cover

Peltigera spp.	(pelt lichens)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE:

Moisture Regime:	2–3 (subxeric-submesic)
Nutrient Regime:	B-C (poor-medium)
* Slope Gradient (%):	18–85
* Slope Position:	upper or crest
* Parent Material:	colluvial or morainal veneer over bedrock
Soil Texture:	moderately coarse to medium
Coarse Fragments (%):	45 (10–60)

COMMENTS: bedrock commonly within 1 m; limited sampling has occurred in this site series

DISTRIBUTION: rare, occurring in isolated pockets

Streptopus roseus

SBSvk/03 **SxwFd – THIMBLEBERRY**

INTERPRETATIONS

Site limitations:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by leaving Fd seed trees on site.***
- sites within this unit with colluvial soils may be difficult to plant; ***attempt to regenerate naturally or use advance regeneration.***

Silvicultural system:
- minimize or align large slash accumulations when logging to help meet site preparation objectives and reduce fire hazard.

Site preparation:
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Fd, Sx, *[Bl, Pl]*

Vegetation potential:
- low

Reforestation:
- manage to maintain Fd component.
- attempt to regenerate naturally if potential exists.
- preserve advance regeneration where feasible.
- Pl may be susceptible to snow damage; choose appropriate seed source.

Concerns:
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***

SBSvk/04 Sxw – OAK FERN

Vaccinium membranaceum

VEGETATION

Tree Layer: 25% cover
hybrid white spruce, subalpine fir

Shrub Layer: 35% cover

Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
[*Rubus parviflorus*	(thimbleberry)]
[*Oplopanax horridus*	(devil's club)]

subalpine fir
[hybrid white spruce]

Herb Layer: 45% cover

Cornus canadensis	(bunchberry)
Rubus pedatus	(five-leaved bramble)
Gymnocarpium dryopteris	(oak fern)
Lycopodium annotinum	(stiff clubmoss)
Streptopus roseus	(rosy twistedstalk)
Orthilia secunda	(one-sided wintergreen)
Clintonia uniflora	(queen's cup)
Tiarella trifoliata	(foamflower)
[*Dryopteris expansa*	(spiny wood fern)]

Rubus pedatus

Moss Layer: 10% cover

Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
[*Hylocomium splendens*	(step moss)]
[*Mnium* spp.	(leafy mosses)]
[*Rhytidiadelphus triquetrus*	(electrified cat's-tail moss)]

SOIL AND SITE:

Moisture Regime:	3 (submesic)
Nutrient Regime:	B-D (poor-rich)
* Slope Gradient (%):	0–98 (often flat)
Slope Position:	variable; usually upper to crest
* Parent Material:	fluvial or morainal, rarely lacustrine
Soil Texture:	medium to moderately fine
Coarse Fragments (%):	3–82

Gymnocarpium dryopteris

DISTRIBUTION: uncommon

SBSvk/04 **Sxw – OAK FERN**

INTERPRETATIONS

Site limitations: – sites within this unit with medium- to fine textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Site preparation: – see Section 12.1

Species choice: – Sx, *[Bl, Fd, Pl]*

Vegetation potential: – high (thimbleberry, red raspberry, lady fern, fireweed)

Reforestation: – plant sturdy stock as soon after harvesting as possible.

– preserve advance regeneration where feasible.

– only plant Fd on coarse-textured soils on southerly aspects.

– Pl may be susceptible to snow damage; choose appropriate seed source.

Concerns: – site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***

– sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; restrict traffic to winter operations or dry soil conditions.

SBSvk/05 Sxw – DEVIL'S CLUB – SPINY WOOD FERN

Lonicera involucrata

VEGETATION

Tree Layer: 30% cover
hybrid white spruce, subalpine fir

Shrub Layer: 40% cover

Oplopanax horridus	(devil's club)
Ribes lacustre	(black gooseberry)
Lonicera involucrata	(black twinberry)
Rubus parviflorus	(thimbleberry)
Sambucus racemosa	(red elderberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Vaccinium membranaceum	(black huckleberry)
Rubus idaeus	(red raspberry)

subalpine fir
hybrid white spruce

Herb Layer: 85% cover

Athyrium filix-femina	(lady fern)
Dryopteris expansa	(spiny wood fern)
Gymnocarpium dryopteris	(oak fern)
Streptopus spp.	(twistedstalks)
Tiarella trifoliata	(foamflower)
Rubus pedatus	(five-leaved bramble)
Cornus canadensis	(bunchberry)
Veratrum viride	(Indian hellebore)
Equisetum sylvaticum	(wood horsetail)
Smilacina racemosa	(false Solomon's-seal)

Athyrium filix-femina

Moss Layer: 35% cover

Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
[*Mnium* spp.	(leafy mosses)]

Dryoptens expansa

SOIL AND SITE:

Moisture Regime:	4–5 (mesic–subhygric)
Nutrient Regime:	C–D (medium–rich)
* Slope Gradient (%):	0–6
* Slope Position:	level, occasionally lower to toe
Parent Material:	variable
Soil Texture:	variable
Coarse Fragments (%):	0–81

DISTRIBUTION: common

SBSvk/05 **Sxw – DEVIL'S CLUB – SPINY WOOD FERN**

INTERPRETATION

Site limitations:
- sites with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that achieves better lateral root development (e.g., Cu-treated) or protect advance regeneration.***
- sites with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1

Species choice:
- ***Sx, [Pl, Bl]***

Vegetation potential:
- extreme (black twinberry, thimbleberry, fireweed)
- prescription must address vegetation competition.

Reforestation:
- preserve vigorous advance Sx regeneration.
- plant sturdy stock immediately after harvesting.
- Pl may be susceptible to snow damage; choose appropriate seed source.

Concerns:
- sites with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***
- site conditions leading to cold air ponding will lead to frost damage of regeneration; ***choose a frost-resistant species (e.g., Pl) or protect advance regeneration.***
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- sites within this unit with silty soils are susceptible to frost heaving; ***bareroot stock will likely resist frost heaving better than plug stock.***
- sites within this unit with thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***
- sites with thick organic horizons (>10 cm) reduce spring soil temperatures, slowing root development; ***attempt to reduce organic horizon thickness during site preparation.***

SBSvk/06 **Sxw – HORSETAIL**

Lonicera involucrata

Equisetum spp.

Pleurozium schreberi

VEGETATION

Tree Layer: 20% cover
hybrid white spruce, subalpine fir

Shrub Layer: 50% cover

Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Viburnum edule	(highbush cranberry)
Spiraea douglasii ssp. *menziesii*	(pink spirea)
Oplopanax horridus	(devil's club)
Vaccinium ovalifolium	(oval-leaved blueberry)
Rosa acicularis	(prickly rose)
Ribes triste	(red swamp currant)

subalpine fir
hybrid white spruce

Herb Layer: 70% cover

Rubus pedatus	(five-leaved bramble)
Athyrium filix-femina	(lady fern)
Gymnocarpium dryopteris	(oak fern)
Streptopus roseus	(rosy twistedstalk)
Dryopteris expansa	(spiny wood fern)
Equisetum spp.	(horsetails)
Cornus canadensis	(bunchberry)
Tiarella trifoliata	(foamflower)
Streptopus amplexifolius	(clasping twistedstalk)

Moss Layer: 35% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
[*Mnium* spp.	(leafy mosses)]

SOIL AND SITE:

Moisture Regime:	5–6 (subhygric–hygric)
Nutrient Regime:	C–D (medium–rich)
* Slope Gradient (%):	0–3, usually 0
* Slope Position:	level, rarely lower
* Parent Material:	fluvial
Soil Texture:	moderately coarse to moderately fine
Coarse Fragments (%):	0–2, usually 0

DISTRIBUTION: common but small in area

SBSvk/06 **Sxw – HORSETAIL**

INTERPRETATION

Site limitations:
- very difficult sites to reforest; ***seriously consider managing these sites as wildlife corridors.***
- sites with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1
- avoid creating an excessive number of microsites, especially on sites within this unit with a water table <30 cm from the surface.
- carefully assess plantable and preparable raised microsites to determine target stocking levels.

Species choice:
- ***Sx, [Bl, Pl]***

Vegetation potential:
- high (fireweed, black twinberry, bluejoint)

Reforestation:
- preserve advance regeneration.
- supplement advance regeneration by planting sturdy stock in groups on available raised microsites.
- consider reducing inter-tree spacing to take advantage of available raised microsites.
- retain Ac veterans where possible for wildlife.
- Pl may be susceptible to snow damage; choose appropriate seed source.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***
- sites within this unit with thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***
- these sites represent important wildlife habitat; ***discuss prescription with fish and wildlife personnel.***
- water table will likely rise above the ground surface in the spring causing seedling mortality on non-elevated sites.

SBSvk/07 Sxw – DEVIL'S CLUB – OSTRICH FERN

Ribes lacustre

VEGETATION

Tree Layer: 20% cover
hybrid white spruce, [subalpine fir, paper birch]

Shrub Layer: 30% cover

Ribes lacustre	(black gooseberry)
Lonicera involucrata	(black twinberry)
Oplopanax horridus	(devil's club)
Rubus parviflorus	(thimbleberry)
Cornus stolonifera	(red-osier dogwood)
Sambucus racemosa	(red elderberry)
Viburnum edule	(highbush-cranberry)
subalpine fir	
[hybrid white spruce]	

Herb Layer: 60% cover

Athyrium filix-femina	(lady fern)
Gymnocarpium dryopteris	(oak fern)
Streptopus spp.	(twistedstalks)
Galium triflorum	(sweet-scented bedstraw)
Viola spp.	(violets)
Smilacina racemosa	(false Solomon's-seal)
Equisetum spp.	(horsetail)
Cornus canadensis	(bunchberry)
Matteuccia struthiopteris	(ostrich fern)

Athyrium filix-femina

Moss Layer: 20% cover

Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Mnium spp.	(leafy mosses)
Pleurozium schreberi	(red-stemmed feathermoss)

SOIL AND SITE:

Moisture Regime:	6 (hygric)
Nutrient Regime:	C–E (medium–very rich)
* Slope Gradient (%):	0–8, usually 0
* Slope Position:	level, rarely lower
* Parent Material:	fluvial, lacustrine
Soil Texture:	moderately fine to fine
Coarse Fragments (%):	usually 0

COMMENTS: high water tables (within 1 m) are probable on these sites

Gymnocarpium dryopteris

DISTRIBUTION: common but small in area

SBSvk/07 **Sxw – DEVIL'S CLUB – OSTRICH FERN**

INTERPRETATIONS

Site limitations:
- sites with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***
- sites with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that achieves better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Site preparation:
- see Section 12.1
- avoid creating an excessive number of microsites, especially on sites within this unit with a water table <30 cm from the surface.
- carefully assess plantable and preparable raised microsites to determine target stocking levels.

Species choice:
- ***Sx, [Bl, Pl]***

Vegetation potential:
- very high (thimbleberry, fireweed, lady fern, black twinberry)

Reforestation:
- preserve advance regeneration.
- supplement advance regeneration by planting sturdy stock in groups on available raised microsites.
- consider reducing inter-tree spacing to take advantage of available raised microsites.
- retain Ac veterans where possible for wildlife.
- Pl may be susceptible to snow damage; choose appropriate seed source.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***
- sites within this unit with thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left.***
- water table will likely rise above the ground surface in the spring causing seedling mortality on non-elevated sites.

SBSvk/08 SbPl – BOG-LAUREL – SPHAGNUM

Ledum groenlandicum

VEGETATION

Tree Layer: 15% cover
lodgepole pine, [black spruce]

Shrub Layer: 50% cover

Ledum groenlandicum	(Labrador tea)
Vaccinium membranaceum	(black huckleberry)
[*Vaccinium ovalifolium*	(oval-leaved blueberry)]
[*Spiraea douglasii* ssp. *menziesii*	(pink spirea)]
[lodgepole pine]	
[black spruce]	
[subalpine fir]	

Herb Layer: 40% cover

Cornus canadensis	(bunchberry)
[*Carex* spp.	(sedges)]
[*Oxycoccus oxycoccos*	(bog cranberry)]
[*Kalmia microphylla* ssp. *occidentalis*	(bog-laurel)]
[*Gaultheria hispidula*	(creeping-snowberry)]

Moss Layer: 70% cover

Sphagnum spp.	(sphagnums)
Pleurozium schreberi	(red-stemmed feathermoss)
[*Ptilium crista-castrensis*	(knight's plume)]

Oxycoccus oxycoccos

SOIL AND SITE:

Moisture Regime:	7 (subhydric)
Nutrient Regime:	A-D (very poor-rich)
Slope Gradient (%):	0
Slope Position:	level
Parent Material:	organic, fluvial, lacustrine
Soil Texture:	fibric, medium to fine
Coarse Fragments (%):	0

DISTRIBUTION: uncommon and small in size

Carex spp.

SBSvk/08 **SbPl – BOG-LAUREL – SPHAGNUM**

INTERPRETATIONS

Site limitations: – site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***

Silvicultural system: – avoid logging.

SBSvk/09 PI – HUCKLEBERRY – CLADINA

Vaccinium membranaceum

VEGETATION

Tree Layer: 20% cover
lodgepole pine, [Douglas-fir, hybrid white spruce]

Shrub Layer: 20% cover

Vaccinium membranaceum	(black huckleberry)
subalpine fir	
hybrid white spruce	
lodgepole pine	

Herb Layer: 5% cover

[*Melampyrum lineare*	(cow-wheat)]
[*Cornus canadensis*	(bunchberry)]
[*Vaccinium caespitosum*	(dwarf blueberry)]
[*Linnaea borealis*	(twinflower)]

Pleurozium schreberi

Moss Layer: 75% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Dicranum spp.	(dicranum mosses)
Cladina spp.	(cladina lichens)
Polytrichum juniperinum	(juniper haircap moss)
Peltigera aphthosa	(freckle lichen)

SOIL AND SITE:

Moisture Regime:	1 (xeric)
Nutrient Regime:	A-B (very poor-poor)
Slope Gradient (%):	0–86
* Slope Position:	crest and upper
* Parent Material:	colluvial or morainal veneer over bedrock
* Soil Texture:	medium to coarse
Coarse Fragments (%):	0–60

COMMENTS: based on few plots

DISTRIBUTION: rare

Cladina spp.

SBSvk/09 PI – HUCKLEBERRY – CLADINA

INTERPRETATIONS

Site limitations:
- site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones.***

Site preparation:
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Pl, ***(Bl, Sx)***

Vegetation potential:
- low

Reforestation:
- attempt to regenerate naturally if potential exists.
- if natural regeneration is not feasible, plant Pl.
- Bl and Sx are not as productive as Pl on these sites.

Concerns:
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.***
- sites within this unit are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***

SBSvk/10 Sxw – SKUNK CABBAGE

Alnus incana ssp. *tenuifolia*

Lysichiton americanum

Sphagnum squarrosum

VEGETATION

Tree Layer: 35% cover
subalpine fir, hybrid white spruce

Shrub Layer: 45% cover

Alnus incana ssp. *tenuifolia*	(mountain alder)
Vaccinium ovalifolium	(oval-leaved blueberry)
Oplopanax horridus	(devil's club)
Vaccinium membranaceum	(black huckleberry)
Menziesia ferruginea	(false azalea)
western hemlock	
subalpine fir	

Herb Layer: 75% cover

Lysichiton americanum	(skunk cabbage)
Athyrium filix-femina	(lady fern)
Gymnocarpium dryopteris	(oak fern)
Equisetum sylvaticum	(wood horsetail)
Tiarella trifoliata	(foamflower)
Glyceria elata	(tall mannagrass)
Valeriana sitchensis	(Sitka valerian)
Circaea alpina	(enchanter's nightshade)
Rubus pedatus	(five-leaved bramble)

Moss Layer: 70% cover

Sphagnum spp.	(sphagnums)
Mnium spp.	(leafy mosses)
Ptilium crista-castrensis	(knight's plume)
Hylocomium splendens	(step moss)
Pellia neesiana	(shiny liverwort)

SOIL AND SITE:

Moisture Regime:	6–7 (hygric-subhydric)
Nutrient Regime:	C-D (medium-rich)
Slope Gradient (%):	2–11
Slope Position:	lower or depression, in narrow drainage channels
Parent Material:	fluvial and lacustrine
Soil Texture:	variable
Coarse Fragments (%):	0–23; commonly zero

DISTRIBUTION: uncommon and small in size

SBSvk/10 **Sxw – SKUNK CABBAGE**

INTERPRETATIONS

Site limitations: –very difficult sites to reforest, high water table will likely rise above the ground surface in spring following harvest; ***seriously consider excluding logging from this unit.***

Silvicultural system: –avoid logging.

SBSvk/51 ALDER – LADY FERN

Alnus viridis

VEGETATION

Tree Layer: 2% cover
(subalpine fir)

Shrub Layer: 90% cover

Alnus viridis ssp. *sinuata*	(sitka alder)
Ribes lacustre	(black gooseberry)
Rubus parviflorus	(thimbleberry)

Herb Layer: 60% cover

Athyrium filix-femina	(lady fern)
Streptopus roseus	(rosy twistedstalk)
Gymnocarpium dryopteris	(oak fern)
Dryopteris assimilis	(spiny wood fern)
Streptopus amplexifolius	(clasping twistedstalk)
Actaea rubra	(baneberry)

Moss Layer: 10% cover

Plagiomnium medium	(common leafy moss)
Brachythecium spp.	(ragged mosses)

Ribes lacustre

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	C–D (medium–rich)
* Aspect:	northerly
Slope Gradient (%):	25–50
* Slope Position:	mid to lower
Parent Material:	morainal or colluvial
* Soil Texture:	moderately coarse to medium
Coarse Fragments (%):	30–70

COMMENTS: humus form contains Ah horizons thicker <2 cm

DISTRIBUTION: rare; small

Athyrium filix-femina

SBSvk/51 **ALDER – LADY FERN**

INTERPRETATIONS

Site limitations: —these sites, which are non forested climax ecosystems, are important components of habitat diversity; *delineate these sites and do not attempt to establish a forest.*

9 WILLOW WET COOL SUB-BOREAL SPRUCE (SBSwk1)

Variant Summary

Location
The SBSwk1 occurs from around McLeod Lake south to the southern boundary of the Prince George Forest Region. It is bordered at lower elevations by the SBSmk1, the SBSmh, and the SBSmw on the west; by the SBSvk and the ICHvk2 on the east; and by the SPSwk2 on the north. At higher elevations, it is bordered by the ESSFwk1 in the south and by the ESSFwk2 in the north. This variant extends well into the Cariboo Forest Region.

Elevation range
660–1140 m

Climate
The SBSwk1 is one of the cooler and wetter biogeoclimatic units of the guide area (see Table 4.1) and has relatively high snowfall. Precipitation during the growing season is intermediate between the dry to moist SBS units and the very wet SBS and ICH, and wet ESSF units.

Distinguishing the SBSwk1 from adjoining biogeoclimatic units
SBSmh has:
- more Douglas-fir, especially on mesic and subhygric sites; and
- more beaked hazelnut and less black huckleberry on mesic sites.

SBSmk1 has:
- less oak fern and more queen's cup on mesic sites; and
- less devil's club on mesic sites.

SBSmw has:
- more Douglas-fir on mesic sites;
- less black huckleberry and black twinberry on mesic sites; and
- no oak fern and lady fern on mesic sites.

SBSvk has:
- less lodgepole pine on mesic and submesic sites;
- devil's club on mesic and submesic sites; and
- more Indian hellebore and spiny wood fern on mesic sites.

SBSwk2 has:
- less black twinberry on mesic sites;
- no Douglas-fir on submesic sites; and
- much less lady fern on subhygric to hygric sites.

ICHvk2 has:
- western hemlock or western redcedar on almost all sites;
- more devil's club and lady fern on mesic sites; and
- skunk cabbage on hygric sites.

ESSFwk1 has:
- white-flowered rhododendron on mesic sites; and
- more Indian hellebore and Sitka valerian on mesic and wetter sites.

ESSFwk2 has:
- white-flowered rhododendron on mesic sites; and
- more Indian hellebore and Sitka valerian on wetter sites.

Forests

Hybrid white spruce and subalpine fir predominate in the forests of the SBSwk1. Lodgepole pine dominates the driest sites, though it occurs on mesic and moist sites as well. Douglas-fir is restricted to drier sites. Black spruce is found in the wetlands and on nutrient-poor upland sites. On localized sites where stand-replacing fire has recently occurred, paper birch may predominate.

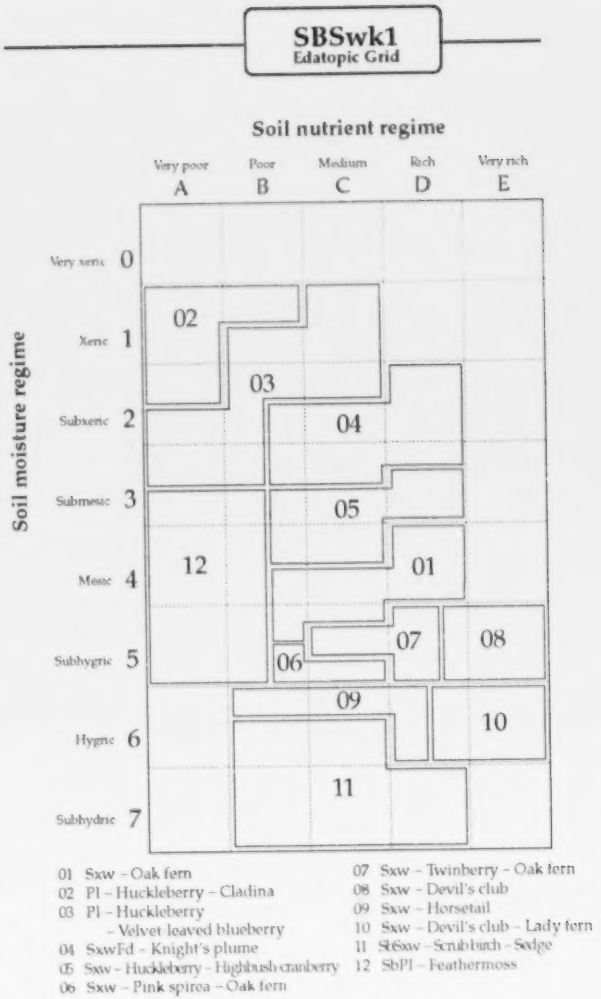


FIGURE 9.1 *Edatopic grid displaying site units of the SBSwk1 variant.*

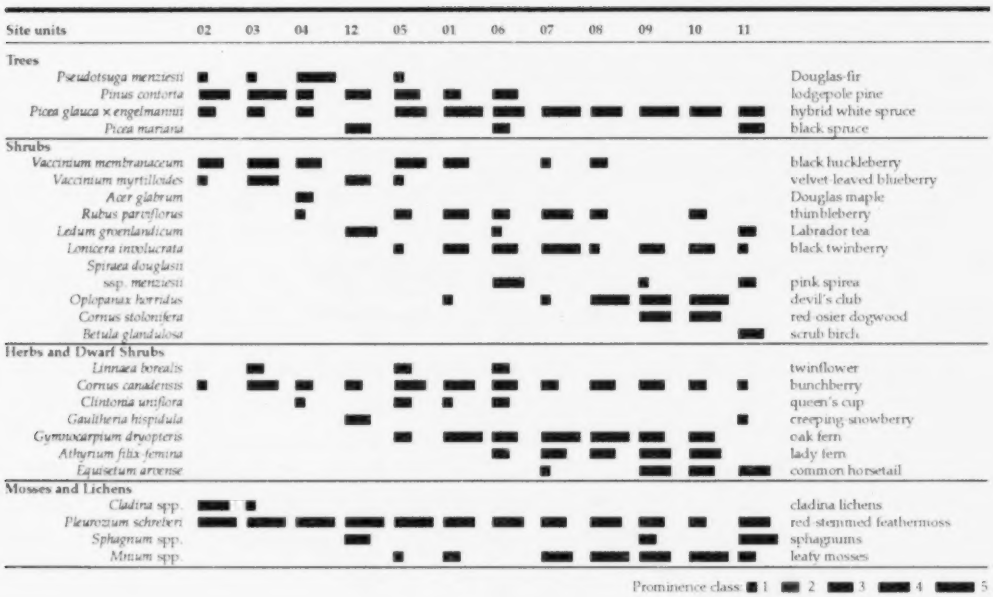


FIGURE 9.2 SBSwk1 vegetation table.

Site Series Key

1a Main canopy mixed but dominated by Douglas-fir.

2a Commonly on colluvial material; >50% coarse fragments; *Acer glabrum* (Douglas maple) (p. 35)[1] present.

SBSwk1/04

2b Never on colluvial material; <50% coarse fragments; *Acer glabrum* absent.

SBSwk1/05

1b Main canopy dominated by tree species other than Douglas-fir.

3a Main canopy dominated by lodgepole pine or black spruce.

4a Black spruce in main canopy; shrub layer often dominated by *Ledum groenlandicum* (Labrador tea) (p. 40).

5a Organic soils, rarely lacustrine or fluvial; *Equisetum* spp. (horsetails) (p. 281–284) high cover (>10%).

SBSwk1/11

5b Lacustrine or glaciofluvial soils; *Equisetum* spp. absent.

SBSwk1/12

4b Black spruce absent from canopy; shrub layer not dominated by *Ledum groenlandicum*.

6a Soils shallow to bedrock or coarse-textured (glacio)fluvial; *Vaccinium myrtilloides* (velvet-leaved blueberry) (p. 43) abundant (>10% cover) or lichens common (>5% cover).

7a If sloping then aspect south-westerly; moderate herb cover (>10%); located on coarse-textured (glacio)fluvial soils or thin soils (40–80 cm) over bedrock.

SBSwk1/03

7b Aspect variable and slope position often crest; low herb cover (<10%); located on very thin soils (<35 cm) over bedrock.

SBSwk1/02

[1] Page numbers refer to the publication *Plants of Northern British Columbia* (MacKinnon et al. [editors] 1992).

6b Soils variable and always deep (i.e., >80 cm to bedrock); *Vaccinium myrtilloides* and lichens not abundant.

8a Often mid- to upper slope; generally moderately coarse to coarse-textured soils; *Gymnocarpium dryopteris* (oak fern) (p. 293) low to moderate cover (<10%).

SBSwk1/05

8b Usually mid- to lower slope or level; variable soil texture; *Gymnocarpium dryopteris* moderate to high cover (>10%).

SBSwk1/01

3b Main canopy dominated by hybrid white spruce.

9a Shrub layer dominated by *Spiraea douglasii* ssp. *menziesii* (pink spirea) (p. 45); lacustrine soils; level slope position.

SBSwk1/06

9b *Spiraea douglasii* ssp. *menziesii* low cover (<2%) or absent; soils variable; slope position variable.

10a *Oplopanax horridus* (devil's club) (p. 36) high cover (>5%); mid- to lower slope, level or depression.

11a *Cornus stolonifera* (red-osier dogwood) (p. 48) moderate to high cover (>5%); *Equisetum* spp. (p. 281–284) cover high (>10%); level slope position adjacent to water or in depression.

SBSwk1/10

11b *Cornus stolonifera* low cover (usually <1%); *Equisetum* spp. low cover (<1%); mid- to lower slope, or level.

SBSwk1/08

10b *Oplopanax horridus* cover low (usually <5%); slope position and soil texture variable.

12a *Equisetum* spp. high cover (>10%); on level or in depression; seepage water usually present.

SBSwk1/09

12b *Equisetum* spp. cover low (<10%); upland site; seepage water generally absent.

13a Canopy has lodgepole pine and/or Douglas-fir present; slope position variable; parent material variable; coarse fragment content variable.

14a Usually mid- to upper slope; *Gymnocarpium dryopteris* low cover (usually <10%) or absent; lodgepole pine usually a significant proportion (>25%) of the canopy.

SBSwk1/05

14b Usually mid- to lower slope, or level; *Gymnocarpium dryopteris* moderate to high cover (usually >10%); lodgepole pine usually a minor component of, or absent from, the canopy.

SBSwk1/01

13b Canopy of hybrid white spruce and subalpine fir, lodgepole pine very low cover (<1%) or absent, Douglas-fir absent; dominantly toe or level slope positions; dominantly fluvial parent material; coarse fragments <10% unless morainal material.

SBSwk1/07

SBSwk1/01 Sxw – OAK FERN

Vaccinium membranaceum

VEGETATION

Tree Layer: 30% cover
hybrid white spruce, subalpine fir,
[lodgepole pine]

Shrub Layer: 30% cover

Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Vaccinium membranaceum	(black huckleberry)
Rubus parviflorus	(thimbleberry)
Viburnum edule	(highbush-cranberry)
[*Oplopanax horridus*	(devil's club)]

subalpine fir
hybrid white spruce

Lonicera involucrata

Herb Layer: 70% cover

Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Orthilia secunda	(one-sided wintergreen)
Rubus pedatus	(five-leaved bramble)
Streptopus roseus	(rosy twistedstalk)
Lycopodium annotinum	(stiff clubmoss)
Tiarella trifoliata	(foamflower)
Clintonia uniflora	(queen's cup)
Smilacina racemosa	(false Solomon's-seal)
Aralia nudicaulis	(wild sarsaparilla)

Moss Layer: 90% cover

Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
Mnium spp.	(leafy mosses)
[*Hylocomium splendens*	(step moss)]

Gymnocarpium dryopteris

SOIL AND SITE:

Moisture Regime:	3–5 (submesic–subhygric)
Nutrient Regime:	B–D (poor–rich)
* Slope Gradient (%):	0–56, commonly <40
* Slope Position:	mid to lower, level
Parent Material:	variable
* Soil Texture:	moderately coarse to fine
Coarse Fragments (%):	0–75, usually <50

DISTRIBUTION: very common and large

SBSwk1/01 **Sxw – OAK FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated) or protect advance regeneration.***

Site preparation:
- see Section 12.1

Species choice:
- Pl, Sx, ***Fd, [Bl]***

Vegetation potential:
- moderate to high (black twinberry, thimbleberry, fireweed)

Reforestation:
- plant sturdy stock as soon after harvesting as possible.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.
- restrict Fd to warm aspects on coarse-textured soils within its natural range.
- help maintain stand diversity on sites to be planted with Pl by mapping aspen patches prior to harvest and planting these areas with spruce.
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.

Concerns:
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

SBSwk1/02 PI – HUCKLEBERRY – CLADINA

Vaccinium membranaceum

VEGETATION

Tree Layer: 20% cover
lodgepole pine, [Douglas-fir], [hybrid white spruce]

Shrub Layer: 20% cover

Vaccinium membranaceum	(black huckleberry)
[*Vaccinium myrtilloides*	(velvet-leaved blueberry)]

subalpine fir
hybrid white spruce

Herb Layer: 5% cover

[*Epilobium angustifolium*	(fireweed)]
[*Melampyrum lineare*	(cow-wheat)]
[*Cornus canadensis*	(bunchberry)]
[*Linnaea borealis*	(twinflower)]
[*Vaccinium caespitosum*	(dwarf blueberry)]

Moss Layer: 75% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Dicranum spp.	(dicranum mosses)
Cladina spp.	(cladina lichens)
Peltigera aphthosa	(freckle lichen)
Polytrichum juniperinum	(juniper haircap moss)

Pleurozium schreberi

SOIL AND SITE:

Moisture Regime:	1–2 (xeric-subxeric)
Nutrient Regime:	A-B (very poor-poor)
Slope Gradient (%):	0–86
* Slope Position:	crest and upper
* Parent Material:	colluvial or morainal veneer over bedrock
* Soil Texture:	medium to coarse
Coarse Fragments (%):	8–70

DISTRIBUTION: rare and small in size

Cladina spp.

SBSwk1/02 **Pl – HUCKLEBERRY – CLADINA**

INTERPRETATIONS

Site limitations:
- very difficult sites to reforest; ***consider managing these sites primarily as wildlife habitat.***
- site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones.***

Silvicultural system:
- minimize or align large slash accumulations when logging to help meet site preparation objectives and reduce fire hazard.

Site preparation:
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Fd, Pl, (***Bl, Sx***)

Vegetation potential:
- low

Reforestation:
- attempt to regenerate naturally if potential exists.
- if natural regeneration is not feasible, plant Fd or Pl.
- Bl and Sx will be significantly less productive than Pl on these sites.

Concerns:
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- sites within this unit are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***

SBSwk1/03 Pl – HUCKLEBERRY – VELVET-LEAVED BLUEBERRY

Vaccinium myrtilloides

Cornus canadensis

Pleurozium schreberi

VEGETATION

Tree Layer: 30% cover
lodgepole pine, [hybrid white spruce], [subalpine fir]

Shrub Layer: 45% cover

Vaccinium myrtilloides	(velvet-leaved blueberry)
Vaccinium membranaceum	(black huckleberry)
Sorbus scopulina	(western mountain-ash)
Spiraea betulifolia	(birch-leaved spirea)
Rosa acicularis	(prickly rose)
Amelanchier alnifolia	(saskatoon)
subalpine fir	
lodgepole pine	

Herb Layer: 25% cover

Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Clintonia uniflora	(queen's cup)
Lycopodium complanatum	(ground-cedar)
Rubus pedatus	(five-leaved bramble)
Vaccinium caespitosum	(dwarf blueberry)

Moss Layer: 95% cover

Peltigera aphthosa	(freckle lichen)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Dicranum polysetum	(wavy-leaved moss)
[*Cladina rangiferina*	(reindeer lichen)]
[*Hylocomium splendens*	(step moss)]

SOIL AND SITE:

Moisture Regime:	1–3 (xeric–submesic)
Nutrient Regime:	A–C (very poor–medium)
Slope Gradient (%):	0–62
Slope Position:	variable, crest to level
Parent Material:	variable, often (glacio)fluvial
* Soil Texture:	coarse
Coarse Fragments (%):	5–88

DISTRIBUTION: common on upper (glacio)fluvial terraces and sites with bedrock within 1 m of the surface

SBSwk1/03 Pl – HUCKLEBERRY – VELVET-LEAVED BLUEBERRY

INTERPRETATIONS

Site limitations:	– sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones on site.***
Silvicultural system:	– minimize or align large slash accumulations when logging to help meet site preparation objectives and reduce fire hazard.
Site preparation:	– light scarification for seedbed preparation or summer logging with no site preparation.
Species choice:	– Pl, Fd, [Sx], (*Bl*)
Vegetation potential:	– low
Reforestation:	– attempt to regenerate naturally if potential exists. – if natural regeneration is not feasible, plant Pl or Fd. – plant Sx on moist microsites only. – Bl is significantly less productive than Pl on these sites.
Concerns:	– site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.*** – full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).*** – sites within this unit are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***

SBSwk1/04 SxwFd – KNIGHT'S PLUME

Acer glabrum

VEGETATION

Tree Layer: 50% cover
Douglas fir, hybrid white spruce, [lodgepole pine]

Shrub Layer: 30% cover

Acer glabrum	(Douglas maple)
Amelanchier alnifolia	(saskatoon)
Vaccinium membranaceum	(black huckleberry)
Rubus parviflorus	(thimbleberry)
Ribes lacustre	(black gooseberry)
Spiraea betulifolia	(birch-leaved spirea)
Rosa acicularis	(prickly rose)
Viburnum edule	(highbush cranberry)

subalpine fir

Herb Layer: 20% cover

Cornus canadensis	(bunchberry)
Streptopus roseus	(rosy twistedstalk)
Aralia nudicaulis	(wild sarsaparilla)
Smilacina racemosa	(false Solomon's-seal)
Orthilia secunda	(one-sided wintergreen)
Disporum hookeri	(Hooker's fairybells)
Clintonia uniflora	(queen's cup)

Streptopus roseus

Moss Layer: 70% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
Dicranum polysetum	(wavy-leaved moss)

SOIL AND SITE:

Moisture Regime:	2–3 (subxeric–submesic)
Nutrient Regime:	B–D (poor–rich)
Slope Gradient (%):	12–63
* Slope Position:	mid to upper, crest
* Slope Aspect:	generally southerly
Parent Material:	variable, commonly colluvial
* Soil Texture:	medium to coarse
Coarse Fragments (%):	5–88, usually >50

Hylocomium splendens

DISTRIBUTION: uncommon; small areas occurring on S to W facing slopes

SBSwk1/04 **SxwFd – KNIGHT'S PLUME**

INTERPRETATIONS

Site limitations:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***

Silvicultural system:
- assess partial cutting feasibility.
- minimize or align large slash accumulations when logging to help meet site preparation objectives and reduce fire hazard.

Site preparation:
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Fd, Pl, *Sx, [Bl]*

Vegetation potential:
- low

Reforestation:
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.
- attempt to preserve Fd advance regeneration when partial cutting.
- promote natural Pl and Fd regeneration by light scarification or spot screefing.
- only plant Sx and Bl on moister microsites.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- site and soil conditions of this unit result in drought hazard for a significant portion of the growing season; ***natural regeneration is generally more adapted to surviving these conditions, especially during establishment.***
- sites within this unit are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***

SBSwk1/05 Sxw – HUCKLEBERRY – HIGHBUSH-CRANBERRY

Vaccinium membranaceum

VEGETATION

Tree Layer: 30% cover
hybrid white spruce, lodgepole pine, subalpine fir, [Douglas-fir]

Shrub Layer: 45% cover

Vaccinium membranaceum	(black huckleberry)
Rubus parviflorus	(thimbleberry)
Spiraea betulifolia	(birch-leaved spirea)
Sorbus scopulina	(western mountain-ash)
Ribes lacustre	(black gooseberry)
Rosa acicularis	(prickly rose)
Viburnum edule	(highbush-cranberry)
Lonicera involucrata	(black twinberry)
subalpine fir	

Cornus canadensis

Herb Layer: 60% cover

Cornus canadensis	(bunchberry)
Clintonia uniflora	(queen's cup)
Gymnocarpium dryopteris	(oak fern)
Streptopus roseus	(rosy twistedstalk)
Rubus pedatus	(five-leaved bramble)
Orthilia secunda	(one-sided wintergreen)
Epilobium angustifolium	(fireweed)
Linnaea borealis	(twinflower)
Lycopodium annotinum	(stiff clubmoss)

Moss Layer: 80% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
[*Rhytidiadelphus triquetrus*	(electrified cat's tail moss)]
[*Hylocomium splendens*	(step moss)]

Ptilium crista-castrensis

SOIL AND SITE:

Moisture Regime:	3–4 (submesic–mesic)
Nutrient Regime:	B–D (poor–rich)
* Slope Gradient (%):	0–75, usually <50
Slope Position:	variable, commonly upper and mid
Parent Material:	morainal, glaciofluvial
* Soil Texture:	generally medium to coarse, occasionally fine
Coarse Fragments (%):	0–90

DISTRIBUTION: common

SBSwk1/05 Sxw – HUCKLEBERRY – HIGHBUSH-CRANBERRY

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated) or protect advance regeneration.***

Site preparation:
- see Section 12.1

Species choice:
- Fd, Pl, Sx, [*Bl*]

Vegetation potential:
- moderate (black twinberry, thimbleberry, fireweed)

Reforestation:
- plant sturdy stock as soon after harvesting as possible.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.
- restrict Fd to warm aspects on coarse-textured soils within its natural range.
- help maintain stand diversity on sites to be planted with Pl by mapping aspen patches prior to harvest and planting these areas with spruce.
- maintain Fd component, especially veterans that are valuable for wildlife and seed production.

Concerns:
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

SBSwk1/06 Sxw – PINK SPIREA – OAK FERN

Spiraea douglasii

VEGETATION

Tree Layer: 40% cover
hybrid white spruce, lodgepole pine, trembling aspen, black spruce

Shrub Layer: 55% cover

Spiraea douglasii ssp. *menziesii*	(pink spirea)
Lonicera involucrata	(black twinberry)
Alnus incana ssp. *tenuifolia*	(mountain alder)
Viburnum edule	(highbush cranberry)
Rosa acicularis	(prickly rose)
Ribes lacustre	(black gooseberry)
[*Rubus parviflorus*	(thimbleberry)]

subalpine fir

Alnus incana ssp. *tenuifolia*

Herb Layer: 35% cover

Gymnocarpium dryopteris	(oak fern)
Cornus canadensis	(bunchberry)
Calamagrostis canadensis	(bluejoint)
Clintonia uniflora	(queen's cup)
Athyrium filix-femina	(lady fern)
Linnaea borealis	(twinflower)
Lycopodium obscurum	(ground pine)
Pyrola asarifolia	(pink wintergreen)

Moss Layer: 50% cover

Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Dicranum scoparium	(broom moss)

Rhytidiadelphus triquetrus

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	B–C (poor–medium)
* Slope Gradient (%):	0–5
* Slope Position:	level
Parent Material:	lacustrine or morainal
* Soil Texture:	moderately fine to fine
Coarse Fragments (%):	0–40

COMMENTS: based on few plots

DISTRIBUTION: uncommon and restricted to cold air drainage pockets

SBSwk1/06 **Sxw – PINK SPIREA – OAK FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Site preparation:
- see Section 12.1
- avoid mechanical site preparation when clay-textured soils occur right to the surface.

Species choice:
- Pl, ***Sx, [Bl, Sb]***

Vegetation potential:
- moderate (trembling aspen, black twinberry, thimbleberry, fireweed)
- a young trembling aspen canopy can help reduce frost damage of planted stock.

Reforestation:
- preserve vigorous Sx regeneration.
- supplement advance regeneration by planting sturdy stock in groups on available raised microsites.
- help maintain stand diversity on sites to be planted with Pl by mapping aspen patches prior to harvest and planting these areas with spruce.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- a combination of poorly structured soils and frost makes these sites difficult to regenerate; ***preserve good quality advance regeneration during harvesting.***
- sites within this unit with fine-textured soils are very vulnerable to compaction under wet conditions; ***restrict traffic to winter operations.***
- site conditions may lead to frost damage of Sx regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***
- sites within this unit with silty soils are susceptible to frost heaving; ***bareroot stock will likely resist frost heaving better than plug stock.***
- if a root-restricting layer is present within 30 cm of soil surface, then sites will have a high blowdown risk.

SBSwk1/07 Sxw – TWINBERRY – OAK FERN

Lonicera involucrata

VEGETATION

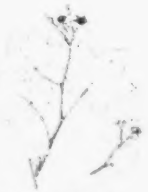
Tree Layer: 35% cover
hybrid white spruce, subalpine fir

Shrub Layer: 50% cover

Lonicera involucrata	(black twinberry)
Rubus parviflorus	(thimbleberry)
Viburnum edule	(highbush-cranberry)
Ribes lacustre	(black gooseberry)
subalpine fir	
hybrid white spruce	

Herb Layer: 65% cover

Gymnocarpium dryopteris	(oak fern)
Tiarella trifoliata	(foamflower)
Streptopus amplexifolius	(clasping twistedstalk)
Equisetum spp.	(horsetails)
Mitella nuda	(common mitrewort)
Athyrium filix-femina	(lady fern)
Dryopteris expansa	(spiny wood fern)
Rubus pedatus	(five-leaved bramble)
Streptopus roseus	(rosy twistedstalk)
Smilacina racemosa	(false Solomon's-seal)
Galium triflorum	(sweet-scented bedstraw)
Cornus canadensis	(bunchberry)



Rubus parviflorus

Moss Layer: 65% cover

Ptilium crista-castrensis	(knight's plume)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Mnium spp.	(leafy mosses)

Gymnocarpium dryopteris

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	C–D (medium rich)
Slope Gradient (%):	0–32
Slope Position:	mid to toe, usually level
Parent Material:	fluvial, occasionally morainal
Soil Texture:	medium
Coarse Fragments (%):	0–35, usually <10

COMMENTS: these sites occur in pockets of cold air drainage

DISTRIBUTION: common; adjacent to stream channels

SBSwk1/07 **Sxw – TWINBERRY – OAK FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1

Species choice:
- Pl, *Sx, [Bl]*

Vegetation potential:
- moderate to high (black twinberry, thimbleberry, fireweed)

Reforestation:
- preserve vigorous Sx regeneration.
- plant sturdy stock as soon after harvesting as possible.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- sites within this unit with silty soils are susceptible to frost heaving; ***bareroot stock will likely resist frost heaving better than plug stock.***
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- site conditions may lead to frost damage of Sx and Bl regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

SBSwk1/08 Sxw – DEVIL'S CLUB

Oplopanax horridus

VEGETATION

Tree Layer: 40% cover
hybrid white spruce, subalpine fir

Shrub Layer: 65% cover

Oplopanax horridus	(devil's club)
Rubus parviflorus	(thimbleberry)
Ribes lacustre	(black gooseberry)
Lonicera involucrata	(black twinberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Vaccinium membranaceum	(black huckleberry)

subalpine fir

Herb Layer: 65% cover

Gymnocarpium dryopteris	(oak fern)
Dryopteris expansa	(spiny wood fern)
Athyrium filix-femina	(lady fern)
Cornus canadensis	(bunchberry)
Streptopus roseus	(rosy twistedstalk)
Smilacina racemosa	(false Solomon's-seal)
Streptopus amplexifolius	(clasping twistedstalk)
Rubus pedatus	(five-leaved bramble)
Tiarella trifoliata	(three-leaved foamflower)

Gymnocarpium dryopteris

Moss Layer: 70% cover

Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
Mnium spp.	(leafy mosses)
[*Rhytidiadelphus triquetrus*	(electrified cat's-tail moss)]

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	D–E (rich–very rich)
Slope Gradient (%):	0–45, usually <15
Slope Position:	variable; usually mid to lower
Parent Material:	lacustrine, morainal, fluvial
Soil Texture:	medium to fine
Coarse Fragments (%):	0–75, 0 in lacustrine

Dryopteris expansa

COMMENTS: seepage usually expected early in growing season

DISTRIBUTION: common

SBSwk1/08 **Sxw – DEVIL'S CLUB**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated) or protect advance regeneration.***

Site preparation:
- see Section 12.1

Species choice:
- ***Sx***, [Pl, ***Bl***]

Vegetation potential:
- very high (black twinberry, thimbleberry, fireweed, lady fern)

Reforestation:
- plant sturdy stock as soon after harvesting as possible.
- preserve advance regeneration where feasible.
- avoid planting Sx or Bl in obvious frost pockets unless risk can be reduced by providing cover.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.
- due to the very high level of competition on theses sites, successfully regenerating them to Pl without high site treatment costs will be difficult.

Concerns:
- sites with thick organic horizons (>10 cm) reduce spring soil temperatures, slowing root development; ***attempt to reduce organic horizon thickness during site preparation.***
- sites with thick organic horizons (>10 cm) and/or shallow (<30 cm) effective rooting depth have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***
- sites with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***

SBSwk1/09 **Sxw – HORSETAIL**

Lonicera involucrata

Equisetum sylvaticum

Equisetum arvense

VEGETATION

Tree Layer: 40% cover
hybrid white spruce, subalpine fir

Shrub Layer: 30% cover

Ribes lacustre	(black gooseberry)
Lonicera involucrata	(black twinberry)
Viburnum edule	(highbush cranberry)
Oplopanax horridus	(devil's club)
Rubus idaeus	(red raspberry)

subalpine fir

Herb Layer: 75% cover

Equisetum sylvaticum	(wood horsetail)
Cornus canadensis	(bunchberry)
Equisetum arvense	(common horsetail)
Gymnocarpium dryopteris	(oak fern)
Dryopteris expansa	(spiny wood fern)
Rubus pedatus	(five-leaved bramble)
Athyrium filix-femina	(lady fern)
Tiarella trifoliata	(foamflower)
Galium triflorum	(sweet-scented bedstraw)

Moss Layer: 70% cover

Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
Rhytidiadelphus triquetrus	(electrified cat's-tail moss)
Hylocomium splendens	(step moss)
Mnium spp.	(leafy mosses)

SOIL AND SITE:

Moisture Regime:	6 (hygric)
Nutrient Regime:	B-D (poor-rich)
Slope Gradient (%):	0–7
Slope Position:	level or depression
Parent Material:	fluvial, occasionally morainal
Soil Texture:	medium to coarse
Coarse Fragments (%):	0–20

COMMENTS: these sites may be influenced by seasonally high water tables associated with nearby rivers and streams; depressions often flooded during snowmelt

DISTRIBUTION: common but small in area

SBSwk1/09 **Sxw – HORSETAIL**

INTERPRETATIONS

Site limitations:
- very difficult sites to reforest; ***consider managing these sites primarily as wildlife habitat.***
- sites with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1
- avoid creating an excessive number of microsites, especially on sites within this unit with a water table <30 cm from the surface.
- carefully assess plantable and preparable raised microsites to determine target stocking levels.

Species choice:
- ***Sx, [Bl, Pl]***

Vegetation potential:
- high (black twinberry, fireweed, bluejoint)

Reforestation:
- preserve advance regeneration.
- supplement advance regeneration by planting sturdy stock in groups on available raised microsites.
- consider reducing inter-tree spacing to take advantage of available raised microsites.
- retain Ac veterans where possible for wildlife.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***
- sites within this unit with thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***
- this unit may provide important habitat for wildlife; ***discuss prescription with fish and wildlife personnel.***
- water table will likely rise above the ground surface in the spring causing seedling mortality on non-elevated sites.
- this unit is critical to the control of runoff streamflow.

SBSwk1/10 **Sxw – DEVIL'S CLUB – LADY FERN**

Oplopanax horridus

VEGETATION

Tree Layer: 25% cover
hybrid white spruce, subalpine fir

Shrub Layer: 75% cover

Oplopanax horridus	(devil's club)
Cornus stolonifera	(red-osier dogwood)
Lonicera involucrata	(black twinberry)
Viburnum edule	(highbush cranberry)
Ribes lacustre	(black gooseberry)
Rubus parviflorus	(thimbleberry)
Alnus incana ssp. *tenuifolia*	(mountain alder)

subalpine fir

Herb Layer: 50% cover

Athyrium filix-femina	(lady fern)
Equisetum arvense	(common horsetail)
Gymnocarpium dryopteris	(oak fern)
Equisetum sylvaticum	(wood horsetail)
Rubus pedatus	(five-leaved bramble)
Tiarella trifoliata	(three-leaved foamflower)
Viola spp.	(violets)
Cornus canadensis	(bunchberry)
Mitella nuda	(common mitrewort)
Dryopteris expansa	(spiny wood fern)

Cornus stolonifera

Moss Layer: 75% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Mnium spp.	(leafy mosses)

SOIL AND SITE:

Moisture Regime:	6 (hygric)
Nutrient Regime:	D–E (rich–very rich)
Slope Gradient (%):	0–7
Slope Position:	level or depression
Parent Material:	fluvial, occasionally morainal
Soil Texture:	medium to coarse
Coarse Fragments (%):	0–20

Athyrium filix-femina

COMMENTS: seepage often present

DISTRIBUTION: uncommon and small in area

SBSwk1/10 **Sxw - DEVIL'S CLUB - LADY FERN**

INTERPRETATIONS

Site limitations:
- these sites have saturated soils that are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1
- avoid creating an excessive number of microsites, especially on sites within this unit with a water table <30 cm from the surface.
- carefully assess plantable and preparable raised microsites to determine target stocking levels.

Species choice:
- ***Sx, [Bl, Pl]***

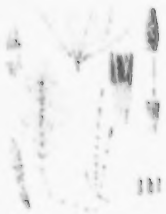
Vegetation potential:
- very high (fireweed, thimbleberry, lady fern, black twinberry)

Reforestation:
- preserve advance regeneration.
- supplement advance regeneration by planting sturdy stock in groups on available raised microsites.
- consider reducing inter-tree spacing to take advantage of available raised microsites.
- retain Ac veterans where possible for wildlife.

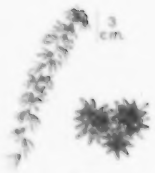
Concerns:
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) is advised.***
- sites within this unit with thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***
- these sites may represent important wildlife habitat; ***discuss prescription with fish and wildlife personnel.***
- water table will likely rise above the ground surface in the spring causing seedling mortality on non-elevated sites.
- this unit is critical to the control of runoff streamflow.

SBSwk1/11 SbSxw - SCRUB BIRCH - SEDGE

Ledum groenlandicum



Equisetum arvense



Sphagnum spp.

VEGETATION

Tree Layer: 20% cover
[black spruce], [lodgepole pine]

Shrub Layer: 30% cover

Ledum groenlandicum	(Labrador tea)
Lonicera involucrata	(black twinberry)
Betula glandulosa	(scrub birch)
Spiraea douglasii ssp. *menziesii*	(pink spirea)
black spruce	
subalpine fir	

Herb Layer: 55% cover

Gaultheria hispidula	(creeping snowberry)
Potentilla palustris	(marsh cinquefoil)
Cornus canadensis	(bunchberry)
Equisetum arvense	(common horsetail)
Pyrola asarifolia	(pink wintergreen)
Rubus pedatus	(five-leaved bramble)
Orthilia secunda	(one-sided wintergreen)
Equisetum sylvaticum	(wood horsetail)
Carex disperma	(soft-leaved sedge)
Calamagrostis canadensis	(bluejoint)

Moss Layer: 90% cover

Sphagnum spp.	(sphagnum mosses)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Peltigera aphthosa	(freckle lichen)
Aulacomnium palustre	(glow moss)

SOIL AND SITE:

Moisture Regime:	6–7 (hygric-subhydric)
Nutrient Regime:	A D (very poor-rich)
* Slope Gradient (%):	0
* Slope Position:	level, depression
Parent Material:	organic, lacustrine, fluvial
Soil Texture:	fine mineral, organic soils commonly mesic in texture
* Coarse Fragments (%):	0

DISTRIBUTION: common but often restricted in size

SBSwk1/11 SbSxw - SCRUB BIRCH - SEDGE

INTERPRETATIONS

Site limitations: – site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***

Silvicultural system: – avoid logging.

SBSwk1/12 SbPl – FEATHERMOSS

Vaccinium myrtilloides

Ledum groenlandicum

Gaultheria hispidula

VEGETATION

Tree Layer: 20% cover
black spruce, lodgepole pine

Shrub Layer: 40% cover

Vaccinium myrtilloides	(velvet leaved blueberry)
Ledum groenlandicum	(Labrador tea)
[*Shepherdia canadensis*	(soopolallie)]

Herb Layer: 25% cover

Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Gaultheria hispidula	(creeping snowberry)
[*Vaccinium caespitosum*	(dwarf blueberry)]
[*Lycepodium complanatum*	(ground-cedar)]
[*Arctostaphylos uva-ursi*	(kinnikinnick)]

Moss Layer: 95% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
[*Sphagnum* spp.	(sphagnum mosses)]

SOIL AND SITE:

Moisture Regime:	3–5 (submesic-subhygric)
Nutrient Regime:	A-B (very poor-poor)
* Slope Gradient (%):	0–5
* Slope Position:	level
* Parent Material:	lacustrine; occasionally glaciofluvial
Soil Texture:	variable
Coarse Fragments (%):	0–50, generally <10

DISTRIBUTION: uncommon and localized

SBSwk1/12 **SbPl – FEATHERMOSS**

INTERPRETATIONS

Site limitations:
- compact soil layers and/or low aeration porosity associated with fine-textured soils will reduce rooting depth and decrease productivity over a rotation; ***regenerate naturally whenever possible.***
- soils are often saturated in the spring, but may experience drought in summer, both resulting in poor root development; ***the poor productivity resulting from these limitations should dictate a limited intensive silvicultural investment.***
- sites with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated), prescribe natural regeneration, or protect advance regeneration.***

Silvicultural system:
- minimize or align large slash accumulations when logging to help meet site preparation objectives and reduce fire hazard.

Site preparation:
- see Section 12.1

Species choice:
- Pl, (***Sx, Sb***)

Vegetation potential:
- low

Reforestation:
- attempt to regenerate naturally if potential exists.
- if natural regeneration is not feasible, plant Pl.
- Sx and Sb will generally be less productive on these sites.

Concerns:
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- site conditions leading to cold air ponding will lead to frost damage of regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***

10 VERY WET COOL INTERIOR CEDAR–HEMLOCK (ICHvk2)

Variant Summary

Location
The ICHvk2 occurs at medium elevations in the valleys of the Fraser River (from around Dome Creek to the Sinclair Mills area), the Torpy River and West Torpy River, in portions of the upper McGregor River, and Slim Creek, and on the slopes around Sugarbowl Mountain and near Purden Lake. This variant is bordered at lower elevations generally by the SBSvk, in its westernmost areas by the SBSwk1, and at higher elevations by the ESSFwk1 in the south and by the ESSFwk2 in the north.

Elevation range
680–1180 m

Climate
The ICHvk2 has more yearly precipitation and lower temperatures than the dry and moist variants of the SBS, and less yearly precipitation and higher temperatures than the wet and very wet variants of the SBS and the two ESSF variants within the guide area. The ICHvk2 also has moderate to high levels of precipitation during the growing season compared with other biogeoclimatic units within the guide area (see Table 4.1).

Distinguishing the ICHvk2 from adjoining biogeoclimatic units
The ICHvk2 is the only biogeoclimatic unit in the guide area dominated by western redcedar and western hemlock.

SBSvk has:
- less western hemlock and western redcedar across all sites; and
- less black huckleberry on submesic sites.

SBSwk1 has:
- less devil's club and lady fern on mesic sites; and
- less skunk cabbage on hygric sites.

ESSFwk1 has:
- more white-flowered rhododendron on submesic and mesic sites;
- no Douglas-fir on subxeric to submesic sites; and
- more lodgepole pine on subxeric and submesic sites.

ESSFwk2 has:

- more white-flowered rhododendron across all sites; and
- less devil's club on mesic sites.

Forests

Forests of the ICHvk2 are primarily mature to old-growth and are dominated by western redcedar and western hemlock, with hybrid white spruce also prominent on all but nutrient-poor very dry and very wet sites. Douglas-fir occurs on the driest sites, while black spruce and lodgepole pine dominate nutrient-poor wetlands. Deciduous stands are relatively rare.

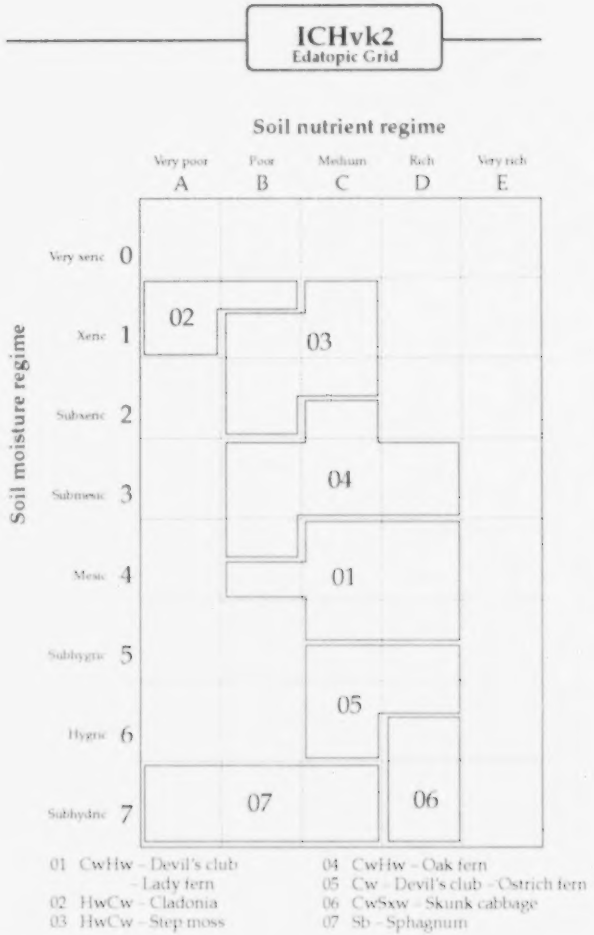


FIGURE 10.1 *Edatopic grid displaying site units of the ICHvk2 variant.*

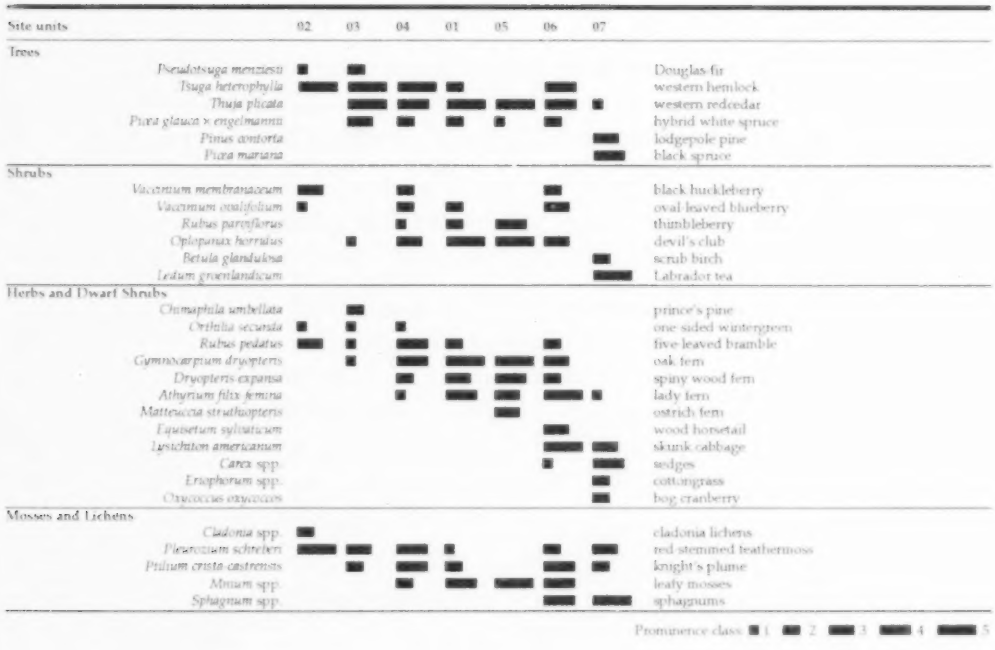


FIGURE 10.2 *ICHvk2 vegetation table*

Site Series Key

1a Black spruce–lodgepole pine canopy; organic or lacustrine soils; *Carex* spp. (sedges) (pp. 258–274)[1] high cover (>10%).

ICHvk2/07

1b Western redcedar or western hemlock canopy; mineral soil; *Carex* spp. low cover (<1%) or absent.

2a *Oplopanax horridus* (devil's club) (p. 36) moderate to high cover (>15%).

3a *Matteuccia struthiopteris* (ostrich fern) (p. 291) moderate cover (>5%); water table usually close to surface; fluvial material.

ICHvk2/05

3b *Matteuccia struthiopteris* absent; seepage water may be present below 50 cm; parent material variable.

ICHvk2/01

2b *Oplopanax horridus* low to moderate cover (<15%) or absent.

4a *Oplopanax horridus* absent; very shallow soil on rock outcrop; open tree canopy; *Cladonia* spp. (cladonia lichens) (p. 332–334) often present.

ICHvk2/02

4b *Oplopanax horridus* low to moderate cover (<15%); deeper soils; closed tree canopy; *Cladonia* spp. often absent.

5a *Lysichiton americanum* (skunk cabbage) (p. 224) moderate to high cover (>15%); *Alnus incana* ssp. *tenuifolia* (mountain alder) (p. 38) low to moderate cover (<15%); narrow drainage channel, water table close to surface.

ICHvk2/06

5b *Lysichiton americanum* and *Alnus incana* ssp. *tenuifolia* absent; not in drainage channel, seepage water not present.

6a Bedrock within 40 cm of surface; *Rubus pedatus* (five-leaved bramble) (p. 92) low cover (<5%); *Vaccinium membranaceum* (black huckleberry) (p. 42) low cover (<1%).

ICHvk2/03

6b Bedrock at depths >40 cm (usually 1 m); *Rubus pedatus* and *Vaccinium membranaceum* moderate cover (>1%).

ICHvk2/04

[1] Page numbers refer to the publication *Plants of Northern British Columbia* (MacKinnon et al. [editors] 1992).

ICHvk2/01 CwHw – DEVIL'S CLUB – LADY FERN

Oplopanax horridus

VEGETATION

Tree Layer: 60% cover
western redcedar, [western hemlock, hybrid white spruce, subalpine fir]

Shrub Layer: 55% cover

Oplopanax horridus	(devil's club)
Ribes lacustre	(black gooseberry)
Rubus parviflorus	(thimbleberry)
Acer glabrum	(Douglas maple)
Vaccinium ovalifolium	(oval-leaved blueberry)
western redcedar	
[subalpine fir]	

Herb Layer: 65% cover

Gymnocarpium dryopteris	(oak fern)
Athyrium filix-femina	(lady fern)
Rubus pedatus	(five-leaved bramble)
Cornus canadensis	(bunchberry)
Smilacina racemosa	(false Solomon's-seal)
Galium triflorum	(sweet-scented bedstraw)
Dryopteris expansa	(spiny wood fern)
Streptopus roseus	(rosy twistedstalk)
Tiarella trifoliata	(foamflower)
Goodyera oblongifolia	(rattlesnake plantain)
Circaea alpina	(enchanter's nightshade)

Rubus parviflorus

Moss Layer: 25% cover

Mnium spp.	(leafy mosses)
[*Hylocomium splendens*	(step moss)]
[*Ptilium crista-castrensis*	(knight's plume)]

SOIL AND SITE:

Moisture Regime:	4–5 (mesic–subhygric)
Nutrient Regime:	B D (poor–rich)
Slope Gradient (%):	0–26
* Slope Position:	variable, commonly mid
Parent Material:	variable
Soil Texture:	variable
Coarse Fragments (%):	0–95

DISTRIBUTION: very common

Gymnocarpium dryopteris

ICHvk2/01 **CwHw – DEVIL'S CLUB – LADY FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***promote natural Hw and Cw regeneration and/or leave Fd seed trees on site.***

Site preparation:
- see Section 12.1

Species choice:
- Sx, Cw, [***Fd, Pl***], (***Hw, Bl***)

Vegetation potential:
- high (fireweed, thimbleberry, lady fern)
- prescription must address vegetation competition.

Reforestation:
- preserve vigorous advance Sx regeneration.
- restrict planting of Fd and Pl to coarser-textured sites.
- plant sturdy stock immediately after harvesting.
- Pl may be susceptible to snow damage; choose appropriate seed source.
- Hw and Bl are significantly less productive than other species on these sites.

Concerns:
- sites within this unit with thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***
- sites with thick organic horizons (>10 cm) reduce spring soil temperatures, slowing root development; ***attempt to reduce organic horizon thickness during site preparation.***
- sites within this unit with silty soils are susceptible to frost heaving; ***bareroot stock will likely resist frost heaving better than plug stock.***
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- site conditions leading to cold air ponding will lead to frost damage of Fd and Sx regeneration; ***leaving a partial canopy and/or choosing a frost-resistant species (e.g., Pl) are advised.***
- advance Hw and Cw regeneration are suspected to have a high risk of heart rot.
- high risk of weevil damage to Sx especially in pure stands.

ICHvk2/02 **HwCw – CLADONIA**

Vaccinium membranaceum

VEGETATION

Tree Layer: 25% cover
western hemlock, [western redcedar, Douglas-fir]

Shrub Layer: 30% cover

Vaccinium membranaceum	(black huckleberry)
Sorbus sitchensis	(Sitka mountain-ash)
Rhododendron albiflorum	(white-flowered rhododendron)
Vaccinium ovalifolium	(oval-leaved blueberry)
western hemlock	
western redcedar	

Herb Layer: 10% cover

Rubus pedatus	(five-leaved bramble)
Cornus canadensis	(bunchberry)
Orthilia secunda	(one-sided wintergreen)
Moneses uniflora	(single delight)

Rubus pedatus

Moss Layer: 95% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Barbilophozia floerkei	(mountain leafy liverwort)
Dicranum pallidisetum	(pale-stalked broom moss)
Hylocomium splendens	(step moss)
Cladonia spp.	(cladonia lichens)
Barbilophozia lycopodioides	(common leafy liverwort)

Pleurozium schreberi

SOIL AND SITE:

Moisture Regime:	1 (xeric)
Nutrient Regime:	A-B (very poor-poor)
Slope Gradient (%):	16–27
* Slope Position:	upper to crest
* Parent Material:	very shallow veneer over bedrock
* Soil Texture:	medium to coarse
Coarse Fragments (%):	15–98

COMMENTS: this ecosystem is found on very shallow soils over rock outcrops; there is usually a moderate cover of rocks and stones on the surface

DISTRIBUTION: rare

ICHvk2/02 **HwCw – CLADONIA**

INTERPRETATIONS

Site limitations:
- site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***promote natural regeneration of Hw and/or leave Fd seed trees on site.***

Silvicultural system:
- assess partial cutting feasibility if Fd is present.
- minimize or align large slash accumulations when logging to help meet site preparation objectives.

Site preparation:
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Fd, *Hw*, [*Pl*], (*Cw*, Sx)

Vegetation potential:
- low

Reforestation:
- attempt to regenerate naturally if potential exists.
- if natural regeneration is not feasible, plant Fd or Pl stock without site preparation.
- Cw, Hw, and Sx are generally not as productive as other tree species.

Concerns:
- sites within this unit with shallow and/or coarse textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***
- full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- advance Hw and Cw regeneration are suspected to have a high risk of heart rot.
- heavy snowpack may cause stem deformity of Pl, especially on steep slopes.

ICHvk2/03 HwCw – STEP MOSS

Chimaphila umbellata

VEGETATION

Tree Layer: 60% cover
western redcedar, western hemlock, Douglas-fir, hybrid white spruce, subalpine fir

Shrub Layer: 30% cover

Oplopanax horridus	(devil's club)
Acer glabrum	(Douglas maple)
Ribes lacustre	(black gooseberry)
western redcedar	
western hemlock	
subalpine fir	

Herb Layer: 20% cover

Cornus canadensis	(bunchberry)
Orthilia secunda	(one-sided wintergreen)
Goodyera oblongifolia	(rattlesnake plantain)
Chimaphila umbellata	(prince's pine)
Clintonia uniflora	(queen's cup)
Smilacina racemosa	(false Solomon's-seal)
Tiarella trifoliata	(foamflower)

Cornus canadensis

Moss Layer: 80% cover

Hylocomium splendens	(step moss)
Rhytidiadelphus triquetrus	(electrified cat's tail moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Peltigera spp.	(peltigera lichens)
Dicranum scoparium	(broom moss)

SOIL AND SITE:

Moisture Regime:	1–2 (xeric–subxeric)
Nutrient Regime:	B–C (poor–medium)
Slope Gradient (%):	0–76
* Slope Position:	mid to crest
* Parent Material:	colluvial or morainal veneer over bedrock
* Soil Texture:	moderately coarse to coarse
Coarse Fragments (%):	43–91

Hylocomium splendens

COMMENTS: the soils are shallow (25–50 cm), but deeper than ICHvk2/02; moderate to low cover of cobbles and stones on surface of site

DISTRIBUTION: uncommon

ICHvk2/03 **HwCw – STEP MOSS**

INTERPRETATIONS

Site limitations:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***promote natural regeneration of Hw and/or leave Fd seed trees on site.***

Silvicultural system:
- minimize or align large slash accumulations when logging to help meet site preparation objectives and reduce fire hazard.

Site preparation:
- light scarification for seedbed preparation or summer logging with no site preparation.

Species choice:
- Fd, [*Pl*], (Bl, Sx, *Cw, Hw*)

Vegetation potential:
- low

Reforestation:
- manage to maintain Fd component.
- promote natural Fd and Hw regeneration by light scarification or spot screefing.
- Cw, Bl, and Sx will be significantly less productive than Fd or Pl on these sites.

Concerns:
- sites within this unit with shallow and/or coarse-textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***
- full tree harvesting may lead to nutrient depletion and seriously reduce numbers of the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***
- heavy snowpack may cause stem deformity of Pl, especially on steep slopes.
- advance Hw and Cw regeneration are suspected to have a high risk of heart rot.

ICHvk2/04 CwHw – OAK FERN

Oplopanax horridus

VEGETATION

Tree Layer: 70% cover
western hemlock, western redcedar, subalpine fir, [hybrid white spruce]

Shrub Layer: 30% cover

Oplopanax horridus	(devil's club)
Vaccinium ovalifolium	(oval-leaved blueberry)
Vaccinium membranaceum	(black huckleberry)
[*Rubus parviflorus*	(thimbleberry)]
western hemlock	
western redcedar	

Herb Layer: 60% cover

Gymnocarpium dryopteris	(oak fern)
Rubus pedatus	(five-leaved bramble)
Cornus canadensis	(bunchberry)
Tiarella trifoliata	(foamflower)
Streptopus spp.	(twistedstalks)
Lycopodium annotinum	(stiff clubmoss)
Dryopteris expansa	(spiny wood fern)
Clintonia uniflora	(queen's cup)
Orthilia secunda	(one-sided wintergreen)

Gymnocarpium dryopteris

Moss Layer: 90% cover

Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Rhytidiadelphus triquetrus	(electrified cat's tail moss)
Mnium spp.	(leafy mosses)

SOIL AND SITE:

Moisture Regime:	2–4 (subxeric–mesic)
Nutrient Regime:	B–D (poor–rich)
Slope Gradient (%):	0–51
Slope Position:	variable
Parent Material:	variable
* Soil Texture:	medium to coarse
Coarse Fragments (%):	0–87

Hylocomium splendens

COMMENTS: medium-textured soils usually compensated by other factors (steep slope, coarse fragments, shallow depth of soil)

DISTRIBUTION: common

ICHvk2/04 **CwHw – OAK FERN**

INTERPRETATIONS

Site limitations:	– ites with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones and/or leaving Fd seed trees on site.***
Site preparation:	– see Section 12.1
Species choice:	– Sx, [Bl, ***Fd, Pl***], (***Cw, Hw***)
Vegetation potential:	– low to moderate
Reforestation:	– manage to maintain Fd component. – promote natural Fd and Hw regeneration by light scarification or spot screefing. – plant Fd or Pl to augment natural regeneration. – Cw, Bl, and Sx will be significantly less productive than Fd or Pl on these sites.
Concerns:	– sites within this unit with shallow and/or coarse textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.*** – heavy snowpack may cause stem deformity of Pl, especially on steep slopes. – advance Hw and Cw regeneration are suspected to have a high risk of heart rot. – sites with shallow (<30 cm) effective rooting depth have increased windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***

ICHvk2/05 Cw – DEVIL'S CLUB – OSTRICH FERN

Oplopanax horridus

VEGETATION

Tree Layer: 70% cover
western redcedar, black cottonwood, hybrid white spruce, paper birch, subalpine fir

Shrub Layer: 80% cover

Oplopanax horridus	(devil's club)
Rubus parviflorus	(thimbleberry)
Ribes lacustre	(black gooseberry)
Acer glabrum	(Douglas maple)
[*Cornus stolonifera*	(red-osier dogwood)]
[*Corylus cornuta*	(beaked hazelnut)]
western redcedar	

Herb Layer: 80% cover

Gymnocarpium dryopteris	(oak fern)
Circaea alpina	(enchanter's nightshade)
Dryopteris expansa	(spiny wood fern)
Athyrium filix-femina	(lady fern)
Tiarella trifoliata	(foamflower)
Matteuccia struthiopteris	(ostrich fern)
Equisetum pratense	(meadow horsetail)
Mitella nuda	(common mitrewort)
Cornus canadensis	(bunchberry)
Smilacina racemosa	(false Solomon's-seal)
Streptopus spp.	(twistedstalks)

Tiarella trifoliata

Moss Layer: 25% cover

Mnium spp.	(leafy mosses)
[*Brachythecium* spp.	(ragged mosses)
[*Timmia austriaca*	(false polytrichum)]

SOIL AND SITE:

Moisture Regime:	5–6 (subhygric-hygric)
Nutrient Regime:	C-D (medium-rich)
Slope Gradient (%):	2–3
* Slope Position:	mid to level
* Parent Material:	fluvial
* Soil Texture:	medium to coarse
Coarse Fragments (%):	14–38

COMMENTS: based on few plots; generally on floodplains

DISTRIBUTION: rare

Circaea alpina

ICHvk2/05 **Cw – DEVIL'S CLUB – OSTRICH FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit with saturated soils are poorly aerated, which slows root development; ***plant seedlings on naturally or artificially raised microsites.***

Site preparation:
- see Section 12.1
- avoid creating an excessive number of mounds (e.g., >300/ha), especially on sites within this unit with a water table <30 cm from the surface.
- carefully assess plantable and preparable raised microsites to determine target stocking levels.

Species choice:
- ***Bl, Sx, [Pl], (Cw, Hw)***

Vegetation potential:
- very high (fireweed, thimbleberry, lady fern)
- prescription must address vegetation competition.

Reforestation:
- preserve advance regeneration when feasible.
- plant sturdy stock in groups, using available raised microsites, rather than evenly across the site.
- young Bl regeneration (<3 m tall) may be susceptible to heavy browsing by moose.

Concerns:
- sites within this unit with high water tables, combined with thick organic horizons (>10 cm), increase the windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such sites.***
- sites within this unit with silty soils are susceptible to frost heaving; ***bareroot stock will likely resist frost heaving better than plug stock.***
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations or dry soil conditions.***
- water table will likely rise above ground surface in spring, causing seedling mortality on non elevated sites.
- site conditions leading to cold air ponding will lead to frost damage of regeneration; ***leaving a partial canopy and/or retaining Ac if present are advised.***
- advance Hw and Cw regeneration are suspected to have a high risk of heart rot.

ICHvk2/06 CwSxw – SKUNK CABBAGE

Vaccinium ovalifolium

VEGETATION

Tree Layer: 35% cover
western hemlock, western redcedar, subalpine fir, hybrid white spruce

Shrub Layer: 45% cover

Vaccinium ovalifolium	(oval-leaved blueberry)
Oplopanax horridus	(devil's club)
Ribes lacustre	(black gooseberry)
Alnus incana ssp. *tenuifolia*	(mountain alder)
Vaccinium membranaceum	(black huckleberry)

western hemlock
western redcedar
subalpine fir

Lysichiton americanum

Herb Layer: 75% cover

Lysichiton americanum	(skunk cabbage)
Athyrium filix-femina	(lady fern)
Gymnocarpium dryopteris	(oak fern)
Equisetum sylvaticum	(wood horsetail)
Glyceria elata	(tall mannagrass)
Valeriana sitchensis	(Sitka valerian)
Circaea alpina	(enchanter's nightshade)
Rubus pedatus	(five-leaved bramble)
Dryopteris expansa	(spiny wood fern)
Tiarella trifoliata	(foamflower)

Moss Layer: 70% cover

Sphagnum spp.	(sphagnum mosses)
Mnium spp.	(leafy mosses)
Ptilium crista-castrensis	(knight's plume)
Hylocomium splendens	(step moss)
Pellia neesiana	(shiny liverwort)
Pleurozium schreberi	(red-stemmed feathermoss)

Athyrium filix-femina

SOIL AND SITE:

Moisture Regime:	6–7 (hygric–subhydric)
Nutrient Regime:	D (rich)
* Slope Gradient (%):	2–11
* Slope Position:	lower or depression, in narrow drainage channels
Parent Material:	fluvial and lacustrine
Soil Texture:	variable
Coarse Fragments (%):	0–23; commonly zero

DISTRIBUTION: uncommon

ICHvk2/06 **CwSxw – SKUNK CABBAGE**

INTERPRETATIONS

Site limitations: – site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***

Silvicultural system: – avoid logging.

ICHvk2/07 Sb – SPHAGNUM

Ledum groenlandicum

VEGETATION

Tree Layer: 15% cover
black spruce, lodgepole pine

Shrub Layer: 50% cover

Ledum groenlandicum	(Labrador tea)
Betula glandulosa	(scrub birch)
Kalmia microphylla ssp. *occidentalis*	(bog laurel)
[*Potentilla palustris*	(marsh cinquefoil)]
black spruce	
lodgepole pine	

Herb Layer: 70% cover

Carex spp.	(sedges)
Oxycoccus oxycoccos	(bog cranberry)
Rubus chamaemorus	(cloudberry)
Eriophorum spp.	(cottongrasses)
[*Menyanthes trifoliata*	(buckbean)]

Moss Layer: 95% cover

Sphagnum spp.	(sphagnum mosses)

Carex spp.

SOIL AND SITE:

Moisture Regime:	7 (subhydric)
Nutrient Regime:	A C (very poor medium)
* Slope Gradient (%):	0–1
* Slope Position:	lower to depressional
Parent Material:	organic, organic over lacustrine, and lacustrine
Soil Texture:	fibric to mesic (organic) and moderately fine to fine (mineral)
Coarse Fragments (%):	0

Sphagnum spp.

COMMENTS: a variety of wetland bog ecosystems have been grouped together in this unit. They range from nutrient poor Labrador tea–Sphagnum bogs to bogs with improved nutrient status dominated by scrub birch, Labrador tea, buckbean, skunk cabbage, sedges, and sphagnum mosses.

DISTRIBUTION: uncommon

ICHvk2/07 **Sb – SPHAGNUM**

INTERPRETATIONS

Site limitations: – site and soil conditions of this unit result in marginal forest productivity; ***seriously consider excluding logging from this unit.***

Silvicultural system: – avoid logging.

11 CARIBOO WET COOL ENGELMANN SPRUCE–SUBALPINE FIR (ESSFwk1)

Variant Summary

Location
The ESSFwk1 occurs at subalpine elevations from the highland between the Fraser and Willow rivers east towards McBride. To the west, it is bordered by the SBSwk1 and SBSvk; in the north and east by the ICHvk2 and ICHwk3; in the southeast by the SBSwk1, ICHvk2, and ESSFmm1; and at higher elevations in the Columbia Mountains by the ESSFwc3. This variant extends well into the Cariboo Forest Region.

Elevation range
1070–1450 m

Climate
The ESSFwk1, being situated at high elevation, is one of the coldest and wettest of the biogeoclimatic units in this guide (see Table 4.1). Much of the precipitation falls as snow.

Distinguishing the ESSFwk1 from adjoining biogeoclimatic units
SBSvk has:
- less white-flowered rhododendron across all sites; and
- more devil's club, especially on mesic sites.

SBSwk1 has:
- less white-flowered rhododendron and oval-leaved blueberry on mesic sites; and
- little Indian hellebore and Sitka valerian on mesic and wetter sites.

ICHvk2 has:
- less white-flowered rhododendron on submesic and mesic sites;
- Douglas-fir on subxeric and submesic sites;
- less lodgepole pine on subxeric and submesic sites; and
- western redcedar or western hemlock prominent tree cover on all sites.

ICHwk3 has:
- western hemlock or western redcedar in the tree layer of all sites except for some wetlands; and
- more devil's club on mesic sites.

ESSFmm1 has:
- more false azalea and less white-flowered rhododendron on mesic sites; and
- more five-leaved bramble and less Sitka valerian on subhygric sites.

ESSFwc3 has:
- very little to no thimbleberry on mesic sites;
- less oak fern on mesic sites; and
- less lady fern on mesic and subhygric sites.

Forests
Climax forests are dominated by Engelmann spruce and subalpine fir. Lodgepole pine is prominent on drier sites. Black spruce is rare or absent. Western hemlock and western redcedar are scattered at lower elevations on circumesic site units.

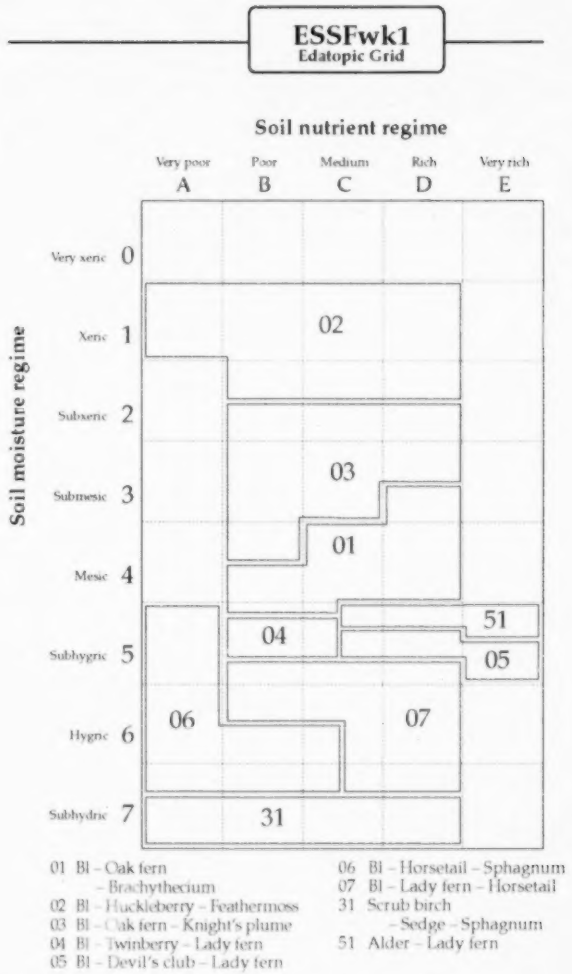


FIGURE 11.1 *Edatopic grid displaying site units of the ESSFwk1 variant.*

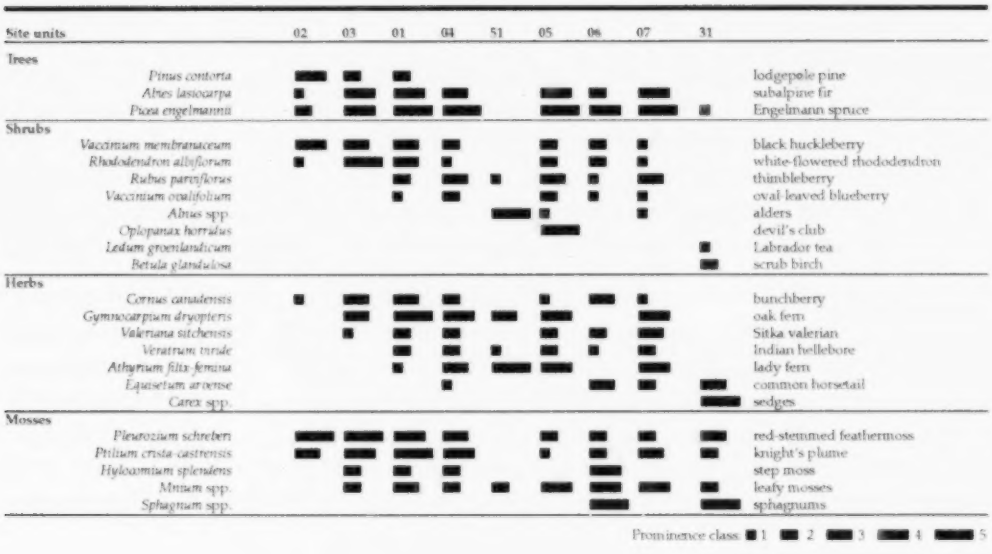


FIGURE 11.2 *ESSFwk1 vegetation table*

Site Series Key

1a Tree canopy very open or absent; site dominated by *Alnus viridis* ssp. *sinuata* (Sitka alder) (p. 37); *Pleurozium schreberi* (red-stemmed feathermoss) (p. 297) low cover (<1%) or absent from the moss layer.

ESSFwk1/51

1b Tree canopy variable cover; site not dominated by *Alnus viridis* ssp. *sinuata*; *Pleurozium schreberi* moderate cover (>1%) in the moss layer.

2a Tree canopy sparse (<10% cover) or dominated by lodgepole pine.

3a Organic soils; *Carex* spp. (sedges) (p. 258–274)[1] and *Sphagnum* spp. (sphagnums) (p. 312–314) moderate to high cover (>5%); *Vaccinium membranaceum* (black huckleberry) (p. 42) absent.

ESSFwk1/31

3b Mineral soils; *Carex* spp. and *Sphagnum* spp. absent; *Vaccinium membranaceum* high cover (>5%).

ESSFwk1/02

2b Tree canopy >5% cover and generally dominated by Engelmann spruce and/or subalpine fir.

4a *Oplopanax horridus* (devil's club) (p. 36) moderate to high cover (>5%); aspect usually 0–90°.

ESSFwk1/05

4b *Oplopanax horridus* low cover (<1%) or absent; aspect variable.

5a *Carex* spp. and/or *Sphagnum* spp. moderate to high cover (>5%); slope gradient <5%.

ESSFwk1/06

5b *Carex* spp. and/or *Sphagnum* spp. low cover (<1%) or absent; slope gradient variable.

6a *Equisetum arvense* (common horsetail) (p. 282) moderate to high cover (>5%); toe of slope to depression.

ESSFwk1/07

[1] Page numbers refer to the publication *Plants of Northern British Columbia* (MacKinnon et al. [editors] 1992).

6b *Equisetum arvense* low cover (<5%) or absent; slope position variable.

7a *Lonicera involucrata* (black twinberry) (p. 48) and *Ribes lacustre* (black gooseberry) (p. 32) moderate to high cover (>5%); seepage water frequently present below 60 cm.

ESSFwk1/04

7b *Lonicera involucrata* and *Ribes lacustre* low cover (<2%) or absent; seepage water absent.

8a *Rhododendron albiflorum* (white-flowered rhododendron) (p. 41) moderate to high cover (5–10%); *Gymnocarpium dryopteris* (oak fern) (p. 293) very high cover (usually >25%); mid- to lower slope.

ESSFwk1/01

8b *Rhododendron albiflorum* very high cover (>30%); *Gymnocarpium dryopteris* moderate to high cover (5–10%); upper slope to crest position.

ESSFwk1/03

NOTES

ESSFwk1/01 BI – OAK FERN – BRACHYTHECIUM

Gymnocarpium dryopteris

VEGETATION

Tree Layer: 40% cover
Engelmann spruce, subalpine fir, [lodgepole pine]

Shrub Layer: 25% cover

Vaccinium membranaceum	(black huckleberry)
Rhododendron albiflorum	(white-flowered rhododendron)
Ribes lacustre	(black gooseberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Rubus parviflorus	(thimbleberry)
subalpine fir	

Herb Layer: 65% cover

Gymnocarpium dryopteris	(oak fern)
Rubus pedatus	(five-leaved bramble)
Cornus canadensis	(bunchberry)
Clintonia uniflora	(queen's cup)
Veratrum viride	(Indian hellebore)
Lycopodium annotinum	(stiff clubmoss)
Listera cordata	(heart-leaved twayblade)
Smilacina stellata	(star-flowered false Solomon's-seal)
Calamagrostis canadensis	(bluejoint)
Valeriana sitchensis	(Sitka valerian)

Rubus pedatus

Moss Layer: 65% cover

Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
Barbilophozia lycopodioides	(common leafy liverwort)
Mnium spp.	(leafy mosses)
Aulacomnium palustre	(glow moss)

Valeriana sitchensis

SOIL AND SITE:

Moisture Regime:	3–5 (submesic–subhygric)
Nutrient Regime:	B–D (poor–rich)
* Slope Gradient (%):	5–55
* Slope Position:	mid (lower to upper)
Parent Material:	usually morainal, sometimes colluvial or fluvial
Soil Texture:	moderately coarse (medium to coarse)
Coarse Fragments (%):	47 (20–85)

DISTRIBUTION: very common and large

ESSFwk1/01 **BI – OAK FERN – BRACHYTHECIUM**

INTERPRETATIONS

Site limitations:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to retain advance regeneration.***

Silvicultural system:
- log on firm snowpack to protect advance regeneration.
- under a partial cutting system, spruce regeneration requires mineral soil exposure and/or planting.
- align large slash accumulations when logging to help meet site preparation objectives and reduce snow creep impacts on seedlings.

Site preparation:
- see Section 12.1

Species choice:
- Bl, Se, [*Pl*]

Vegetation potential:
- moderate to high (thimbleberry, fireweed, white-flowered rhododendron)

Reforestation:
- preserve advance regeneration where feasible.
- plant stock with large caliper and low shoot-to-root ratio immediately after harvest.

Concerns:
- sites within this unit with thick organic horizons (>10 cm) have reduced spring soil temperatures, which slow root development; ***reduce organic horizon thickness during site preparation.***
- site conditions leading to cold air ponding will lead to frost damage of regeneration; ***leaving a partial canopy is advised.***
- heavy snowpack may cause stem deformity, especially on steep slopes; ***obstacle planting is advised.***

ESSFwk1/02 BI – HUCKLEBERRY – FEATHERMOSS

Vaccinium membranaceum

VEGETATION

Tree Layer: 20% cover
lodgepole pine, [Engelmann spruce], [subalpine fir]

Shrub Layer: 30% cover

Vaccinium membranaceum	(black huckleberry)
Rhododendron albiflorum	(white-flowered rhododendron)
Amelanchier alnifolia	(saskatoon)
[*Spiraea betulifolia*	(birch-leaved spirea)]
[*Juniperus communis*	(common juniper)]
subalpine fir	

Herb Layer: 5% cover

Cornus canadensis	(bunchberry)
Orthilia secunda	(one-sided wintergreen)
[*Linnaea borealis*	(twinflower)]
[*Clintonia uniflora*	(queen's cup)]

Cornus canadensis

Moss Layer: 65% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume moss)
Polytrichum juniperinum	(juniper hair-cap moss)
[*Cladonia* spp.	(cladonia lichens)]
[*Cladina* spp.	(cladina lichens)]

SOIL AND SITE:

Moisture Regime:	1–2 (xeric-subxeric)
Nutrient Regime:	A-D (very poor-rich)
Slope Gradient (%):	0–60
* Slope Position:	crest to upper
Parent Material:	usually morainal, also colluvial or saprolitic
Soil Texture:	moderately coarse (medium to coarse)
* Coarse Fragments (%):	67 (10–95)

COMMENTS: this association occurs on shallow soils or on steep, south aspects with rubbly colluvial soils

DISTRIBUTION: uncommon and small

Pleurozium schreberi

ESSFwk1/02 **Bl – HUCKLEBERRY – FEATHERMOSS**

INTERPRETATIONS

Site limitations: – sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones.***

Silvicultural system: – align large slash accumulations when logging to help meet site preparation objectives and reduce snow creep impacts on seedlings.

Site preparation: – light scarification for seedbed preparation or summer logging with no site preparation.

Species choice: – ***Bl, Se, Pl***

Vegetation potential: – low

Reforestation: – attempt to regenerate naturally if potential exists.
– if natural regeneration is not feasible, plant mixtures of Pl, Se, and Bl.

Concerns: – sites within this unit with shallow and/or coarse-textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***
– full tree harvesting may lead to nutrient depletion and seriously reduce the number and distribution of cones; ***distribute woody debris and cones across these sites (i.e., lop and scatter).***

ESSFwk1/03 **BI – OAK FERN – KNIGHT'S PLUME**

Rhododendron albiflorum

Vaccinium membranaceum

Rubus pedatus

VEGETATION

Tree Layer: 40% cover
Engelmann spruce, subalpine fir, [lodgepole pine]

Shrub Layer: 70% cover

Rhododendron albiflorum	(white-flowered rhododendron)
Vaccinium membranaceum	(black huckleberry)
Ribes lacustre	(black gooseberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
subalpine fir	
Engelmann spruce	

Herb Layer: 30% cover

Rubus pedatus	(five-leaved bramble)
Gymnocarpium dryopteris	(oak fern)
Streptopus roseus	(rosy twistedstalk)
Lycopodium annotinum	(stiff clubmoss)
Cornus canadensis	(bunchberry)
Clintonia uniflora	(queen's cup)
Veratrum viride	(Indian hellebore)
[*Valeriana sitchensis*	(Sitka valerian)]
[*Tiarella trifoliata*	(foamflower)]

Moss Layer: 60% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Barbilophozia lycopodioides	(common leafy liverwort)
Ptilium crista-castrensis	(knight's plume)
[*Mnium* spp.	(leafy mosses)]
[*Hylocomium splendens*	(step moss)]

SOIL AND SITE:

Moisture Regime:	2–3 (subxeric-submesic)
Nutrient Regime:	B-D (poor-rich)
Slope Gradient (%):	23 (0–54)
* Slope Position:	crest to mid
* Parent Material:	dominantly morainal, occasionally colluvial
Soil Texture:	moderately coarse (medium to coarse)
* Coarse Fragments (%):	61 (40–85)

DISTRIBUTION: common

ESSFwk1/03 BI – OAK FERN – KNIGHT'S PLUME

INTERPRETATIONS

Site limitations:
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***attempt to regenerate naturally by retaining Pl cones or preserving advance regeneration.***

Silvicultural system:
- log on firm snowpack to protect advance regeneration.
- under a partial cutting system, spruce regeneration requires mineral soil exposure and/or planting.
- minimize or align large slash accumulations when logging to help meet site preparation objectives and reduce snow creep impacts on seedlings.

Site preparation:
- see Section 12.1

Species choice:
- Se, [Bl, *Pl*]

Vegetation potential:
- low

Reforestation:
- preserve advance regeneration where feasible.
- planting Pl may be an option on these sites below 1100 m, but use provenances from high elevation, high snowpack areas.

Concerns:
- sites within this unit with shallow and/or coarse-textured soils are vulnerable to nutrient deficiency if forest floors are reduced; ***avoid site preparation methods that reduce forest floor thickness, such as slashburning or brushblading.***

ESSFwk1/04 **BI - TWINBERRY - LADY FERN**

Lonicera involucrata

Gymnocarpium dryopteris

Valeriana sitchensis

VEGETATION

Tree Layer: 35% cover
Engelmann spruce, subalpine fir

Shrub Layer: 40% cover

Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Rhododendron albiflorum	(white-flowered rhododendron)
Rubus parviflorus	(thimbleberry)

subalpine fir

Herb Layer: 60% cover

Gymnocarpium dryopteris	(oak fern)
Valeriana sitchensis	(Sitka valerian)
Veratrum viride	(Indian hellebore)
Rubus pedatus	(five-leaved bramble)
Cornus canadensis	(bunchberry)
Streptopus spp.	(twistedstalks)
Tiarella trifoliata	(three-leaved foamflower)
Athyrium filix-femina	(lady fern)

Moss Layer: 55% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Mnium spp.	(leafy mosses)
Hylocomium splendens	(step moss)

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	B-C (poor-medium)
Slope Gradient (%):	0–45
* Slope Position:	variable; usually mid to lower
Parent Material:	morainal, fluvial, colluvial
Soil Texture:	moderately coarse to moderately fine
* Coarse Fragments (%):	47 (0–80)

COMMENTS: seepage water is commonly present below 60 cm

DISTRIBUTION: common but small in size

ESSFwk1/04 **BI – TWINBERRY – LADY FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit with thick organic horizons (>10 cm) have reduced spring soil temperatures, which slow root development; ***reduce organic horizon thickness during site preparation.***
- sites within this unit with high coarse fragment content (>70%) will have significantly reduced soil moisture retention and will be extremely difficult to plant; ***retain advance regeneration.***

Silvicultural system:
- log on firm snowpack to protect advance regeneration.
- under a partial cutting system, spruce regeneration requires mineral soil exposure and/or planting.
- align large slash accumulations when logging to help meet site preparation objectives and reduce snow creep.

Site preparation:
- see Section 12.1

Species choice:
- ***Bl, Se, [Pl]***

Vegetation potential:
- high (thimbleberry, fireweed, white-flowered rhododendron, lady fern)
- prescription must address vegetation competition.

Reforestation:
- preserve advance regeneration where feasible.
- planting Pl may be an option on these sites below 1100 m, but provenances from high elevation, high snowpack areas must be used.

Concerns:
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy is advised.***
- sites within this unit with fine-textured soils are vulnerable to compaction under wet conditions; ***restrict traffic to winter operations.***
- heavy snowpack may cause stem deformity, especially on steep slopes; ***obstacle planting is advised.***

ESSFwk1/05 BI – DEVIL'S CLUB – LADY FERN

Oplopanax horridus

VEGETATION

Tree Layer: 40% cover
subalpine fir, Engelmann spruce

Shrub Layer: 60% cover

Oplopanax horridus	(devil's club)
Rubus parviflorus	(thimbleberry)
Ribes lacustre	(black gooseberry)
Vaccinium membranaceum	(black huckleberry)
Sambucus racemosa	(red elderberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
[*Rhododendron albiflorum*	(white-flowered rhododendron)]
subalpine fir	

Herb Layer: 60% cover

Athyrium filix-femina	(lady fern)
Veratrum viride	(Indian hellebore)
Rubus pedatus	(five-leaved bramble)
Streptopus spp.	(twistedstalks)
Gymnocarpium dryopteris	(oak fern)
Dryopteris expansa	(spiny wood fern)
Tiarella trifoliata	(foamflower)
Valeriana sitchensis	(Sitka valerian)
Cornus canadensis	(bunchberry)

Athyrium filix-femina

Moss Layer: 45% cover

Mnium spp.	(leafy mosses)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	D–E (rich–very rich)
* Aspect:	mostly north-east
Slope Gradient (%):	13–55
* Slope Position:	mid to lower
Parent Material:	morainal or colluvial, rarely fluvial
Soil Texture:	moderately coarse (medium to coarse)
* Coarse Fragments (%):	40 (15–70)

Mnium spp.

COMMENTS: seepage water may be present

DISTRIBUTION: common, especially on north aspects

ESSFwk1/05 **Bl – DEVIL'S CLUB – LADY FERN**

INTERPRETATIONS

Site limitations:
- sites within this unit with thick organic horizons (>10 cm) have reduced spring soil temperatures, which slow root development; ***reduce organic horizon thickness during site preparation.***

Silvicultural system:
- log on firm snowpack to protect advance regeneration.
- under a partial cutting system, spruce regeneration requires mineral soil exposure and/or planting.
- minimize or align large slash accumulations when logging to help meet site preparation objectives and reduce snow creep.

Site preparation:
- see Section 12.1

Species choice:
- Bl, Se, [*Pl*]

Vegetation potential:
- very high (lady fern, white-flowered rhododendron, fireweed, thimbleberry)
- prescription must address vegetation competition.

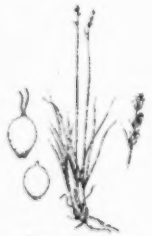
Reforestation:
- preserve advance regeneration where feasible.
- plant stock with large caliper and low shoot-to-root ratio immediately after harvest.

Concerns:
- site conditions may lead to frost damage of regeneration, especially in any naturally occurring or artificially created depression; ***leaving a partial canopy and/or preserving advance regeneration are advised.***
- heavy snowpack may cause stem deformity, especially on steep slopes; ***obstacle planting is advised.***
- trafficability will be a problem on these sites during the summer.

ESSFwk1/06 **BI – HORSETAIL – SPHAGNUM**

Lonicera involucrata

Equisetum arvense



Carex disperma

VEGETATION

Tree Layer: 20% cover
Engelmann spruce, subalpine fir, [western redcedar]

Shrub Layer: 45% cover

Vaccinium membranaceum	(black huckleberry)
Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
[*Rhododendron albiflorum*	(white-flowered rhododendron)]

subalpine fir
Engelmann spruce

Herb Layer: 60% cover

Equisetum arvense	(common horsetail)
Cornus canadensis	(bunchberry)
Carex disperma	(soft-leaved sedge)
Streptopus roseus	(rosy twistedstalk)
Rubus pedatus	(five-leaved bramble)
Pyrola asarifolia	(pink wintergreen)
Tiarella trifoliata	(three-leaved foamflower)
[*Leptarrhena pyrolifolia*	(leatherleaf saxifrage)]

Moss Layer: 85% cover

Sphagnum spp.	(sphagnum mosses)
Hylocomium splendens	(step moss)
Mnium spp.	(leafy mosses)
Aulacomnium palustre	(glow moss)
Barbilophozia lycopodioides	(common leafy liverwort)
Pleurozium schreberi	(red-stemmed feathermoss)
Drepanocladus uncinatus	(sickle-moss)

SOIL AND SITE:

Moisture Regime:	5–6 (subhygric–hygric)
Nutrient Regime:	A–C (very poor–medium)
* Slope Gradient (%):	0–2
* Slope Position:	lower to depressional
* Parent Material:	morainal; rarely fluvial
Soil Texture:	moderately coarse (coarse to moderately fine)
Coarse Fragments (%):	38 (0–65)

COMMENTS: based on few plots

DISTRIBUTION: rare; small

ESSFwk1/06 **Bl – HORSETAIL – SPHAGNUM**

INTERPRETATIONS

Site limitations:	– very difficult sites to reforest; ***consider managing these sites primarily as wildlife habitat.***
	– sites within this unit have thick organic horizons (>10 cm) that reduce spring soil temperatures, slowing root development; ***plant seedlings on naturally or artificially raised microsites.***
Silvicultural system:	– log on firm snowpack to protect advance regeneration.
	– under a partial cutting system, spruce regeneration requires mineral soil exposure and/or planting.
Site preparation:	– see Section 12.1
	– avoid creating an excessive number of microsites (e.g., >300/ha) especially on sites within this unit with a water table <30 cm from the surface.
Species choice:	– ***Bl, Se***
Vegetation potential:	– moderate to high (white-flowered rhododendron, fireweed, Sitka valerian)
Reforestation:	– plant stock in groups, using available raised microsites, rather than evenly across the site.
	– preserve advance regeneration where feasible.
Concerns:	– sites within this unit have thick organic horizons (>10 cm) that increase windthrow hazard; ***block layouts must have windfirm boundaries, or a wide buffer of standing timber must be left around such si.es.***
	– site conditions leading to cold air ponding will lead to frost damage of regeneration; ***leaving a partial canopy is advised.***
	– water table will likely rise above the ground surface in the spring, causing seedling mortality on non-elevated sites.
	– this unit is critical to the control of runoff streamflow.
	– these sites represent important wildlife habitat; ***discuss prescription with fish and wildlife personnel.***

ESSFwk1/07 BI – LADY FERN – HORSETAIL

Lonicera involucrata

VEGETATION

Tree Layer: 40% cover
Engelmann spruce, subalpine fir

Shrub Layer: 30% cover

Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Vaccinium membranaceum	(black huckleberry)
Vaccinium ovalifolium	(oval-leaved blueberry)
Rubus parviflorus	(thimbleberry)

subalpine fir
[Engelmann spruce]

Herb Layer: 40% cover

Athyrium filix-femina	(lady fern)
Gymnocarpium dryopteris	(oak fern)
Valeriana sitchensis	(Sitka valerian)
Equisetum arvense	(common horsetail)
Rubus pedatus	(five-leaved bramble)
Thalictrum occidentale	(western meadowrue)
Tiarella trifoliata	(three-leaved foamflower)
Cornus canadensis	(bunchberry)
Streptopus roseus	(rosy twistedstalk)
Actaea rubra	(baneberry)

Athyrium filix-femina

Moss Layer: 30% cover

Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
[*Mnium* spp.	(leafy mosses)]

SOIL AND SITE:

Moisture Regime:	5–6 (subhygric–hygric)
Nutrient Regime:	B–D (poor–rich)
Slope Gradient (%):	0–34
Slope Position:	lower, level, depression
Parent Material:	morainal, fluvial
Soil Texture:	moderately coarse to moderately fine
Coarse Fragments (%):	0–65

Valeriana sitchensis

DISTRIBUTION: generally restricted to draws and depressions

ESSFwk1/07 **BI – LADY FERN – HORSETAIL**

INTERPRETATIONS

Site limitations:
- sites within this unit with medium- to fine-textured lacustrine soils often have poor soil structure, leading to poor root growth; ***plant stock that will achieve better lateral root development (e.g., Cu-treated) or protect advance regeneration.***
- sites within this unit have thick organic horizons (>10 cm) that reduce spring soil temperatures, slowing root development; ***plant seedlings on naturally or artificially raised microsites.***

Silvicultural system:
- log on firm snowpack to protect advance regeneration.
- under a partial cutting system, spruce regeneration requires mineral soil exposure and/or planting.

Site preparation:
- see Section 12.1
- avoid an excessive number of microsites (e.g., >300/ha), especially on sites within this unit with a water table <30 cm from the surface.

Species choice:
- ***Bl, Se***

Vegetation potential:
- high (lady fern, white-flowered rhododendron, thimbleberry, fireweed)

Reforestation:
- plant stock in groups, using available raised microsites, rather than evenly across the site.
- preserve advance regeneration where feasible.

Concerns:
- site conditions leading to cold air ponding will lead to frost damage of regeneration; ***leaving a partial canopy is advised.***
- sites within this unit with restricted rooting and/or thick organic horizons (>10 cm) have increased windthrow hazard; ***block layouts must have windfirm boundaries.***

ESSFwk1/31 SCRUB BIRCH – SEDGE – SPHAGNUM

Equisetum arvense

Carex spp.

Sphagnum capillaceum

VEGETATION

Tree Layer: 5% cover
(lodgepole pine, Engelmann spruce)

Shrub Layer: 15% cover

Lonicera involucrata	(black twinberry)
Salix spp.	(willows)
Ledum groenlandicum	(Labrador tea)
Betula glandulosa	(scrub birch)
Engelmann spruce	
subalpine fir	

Herb Layer: 70% cover

Carex spp.	(sedges)
Equisetum arvense	(common horsetail)
Senecio triangularis	(arrow-leaved groundsel)
Gaultheria hispidula	(creeping snowberry)
Pyrola asarifolia	(pink wintergreen)
Linnaea borealis	(twinflower)

Moss Layer: 65% cover

Sphagnum spp.	(sphagnum mosses)
Pleurozium schreberi	(red-stemmed feathermoss)
Aulacomnium palustre	(glow moss)

SOIL AND SITE:

Moisture Regime:	7 (subhydric)
Nutrient Regime:	A D (very poor-rich)
* Slope Gradient (%):	0–5
* Slope Position:	depression or level
Parent Material:	organic
* Soil Texture:	humic (organic material)
Coarse Fragments (%):	0

COMMENTS: seepage commonly present above 20 cm

DISTRIBUTION: rare; small

ESSFwk1/31 SCRUB BIRCH – SEDGE – SPHAGNUM

INTERPRETATIONS

Site limitations: – the combination of very poor productivity and high wildlife values means that these sites should be protected from harvesting.

Silvicultural system: – avoid logging.

ESSFwk1/51 ALDER – LADY FERN

Alnus viridis ssp. *sinuata*

VEGETATION

Tree Layer: 2% cover
[subalpine fir]

Shrub Layer: 90% cover

Alnus viridis ssp. *sinuata*	(Sitka alder)
Ribes lacustre	(black gooseberry)
Rubus parviflorus	(thimbleberry)

Herb Layer: 60% cover

Athyrium filix-femina	(lady fern)
Streptopus roseus	(rosy twistedstalk)
Gymnocarpium dryopteris	(oak fern)
Dryopteris assimilis	(spiny wood fern)
Streptopus amplexifolius	(clasping twistedstalk)
Actaea rubra	(baneberry)

Moss Layer: 10% cover

Mnium medium	(leafy moss)
Brachythecium spp.	(ragged mosses)

Ribes lacustre

SOIL AND SITE:

Moisture Regime:	5 (subhygric)
Nutrient Regime:	C-D (medium-rich)
* Aspect:	northerly
Slope Gradient (%):	25–50
* Slope Position:	mid to lower
Parent Material:	morainal or colluvial
* Soil Texture:	moderately coarse to medium
Coarse Fragments (%):	30–70

COMMENTS: humus form contains Ah horizons thicker than 2 cm

DISTRIBUTION: common but small

Athyrium filix-femina

ESSFwk1/51 ALDER – LADY FERN

INTERPRETATIONS

Site limitations:

– these sites, which are non-forested climax ecosystems, are important components of habitat diversity; ***delineate these sites and do not attempt to establish a forest.***

12 INDIRECT AND GENERAL INTERPRETATIONS

This section contains indirect interpretative keys for site preparation (Section 12.1), and important site unit–wildlife habitat relationships (Section 12.2).

12.1 Site Preparation Keys

The keys in this section are intended to give the user a variety of site preparation treatment options based on the characteristics of the site for which treatments are prescribed. Two publications, *Mechanical Site Preparation Equipment in North Central British Columbia* (Coates and Haeussler 1987) and *Site Preparation Strategies to Manage Soil Disturbance* (Curran et al. 1990), were used extensively in preparing these keys. The keys are not meant to replace these documents, which should be consulted before making a final site preparation decision. Another useful reference is Chapters 11 and 12 in *Regenerating British Columbia's Forests* (Lavender et al. [editors] 1990). Before using the site preparation keys, ensure site and soil information has been collected and the site unit identified. The following steps should then be followed.

Step 1 Using Table 12.1, identify the appropriate soil grouping for the site unit using coarse fragment content and soil texture information previously collected.

Step 2 Using Table 12.2, identify the appropriate key for the site unit you have previously identified.

Step 3 Proceed to appropriate key and, using site and soil information, advance step by step through the key until a site preparation code box is reached.

Step 4 Refer to site preparation code descriptions and decide which site preparation alternative best suits the site limitations and management objectives for the site.

TABLE 12.1 *Soil grouping for all combinations of coarse fragment content and soil texture (from Lewis and Carr 1993)*

	Coarse fragment content		
Texture[a]	**<30%**	**30–70%**	**>0%**
S, LS, SL	Coarse	Very Coarse	Very Coarse
vfSL, Si	Medium	Coarse	Very Coarse
SiL, Loam	Medium	Medium	Coarse
SC, SiC, SCL SiCL, CL, C	Fine	Medium	Medium

[a] S = sand, sandy C = clay, clayey vfSL = very fine sandy loam
Si = silt, silty L = loam, loamy

TABLE 12.2 *Figure and page numbers for site preparation keys*

Site series	Key	Figure number	Page number
SBSdw1			
01 SxwFd – Pinegrass	Moist Sites	12.3	12 • 7
06 SxwFd – Thimbleberry	Moist Sites	12.3	12 • 7
07 Sxw – Twinberry – Coltsfoot	Moist Sites	12.3	12 • 7
08 Sxw – Twinberry – Oak fern	Wet Sites	12.1	12 • 4
09 Sxw – Horsetail – Glow moss	Very Wet Sites	12.2	12 • 6
SBSmh			
01 SxwFd – Hazelnut	Moist Sites	12.3	12 • 7
05 SxwFd – Feathermoss	Moist Sites	12.3	12 • 7
06 SxwFd – Coltsfoot	Moist Sites	12.3	12 • 7
07 SxwEp – Devil's club	Wet Sites	12.1	12 • 4
08 Sxw – Ostrich fern	Very Wet Sites	12.2	12 • 6
09 Sxw – Horsetail – Glow moss	Very Wet Sites	12.2	12 • 6
SBSmw			
01 SxwFd – Falsebox	Moist Sites	12.3	12 • 7
05 Sxw – Pink spirea	Wet Sites	12.1	12 • 4
06 Sxw – Oak fern	Wet Sites	12.1	12 • 4
07 Sxw – Twinberry – Oak fern	Wet Sites	12.1	12 • 4
08 Sxw – Devil's club	Wet Sites	12.1	12 • 4
09 Sxw – Horsetail	Very Wet Sites	12.2	12 • 6

TABLE 12.2 *Continued*

Site series	Key	Figure number	Page number
SBSvk			
01 Sxw – Devil's club	Wet Sites	12.1	12 • 4
04 Sxw – Oak fern	Wet Sites	12.1	12 • 4
05 Sxw – Devil's club – Spiny wood fern	Wet Sites	12.1	12 • 4
06 Sxw – Horsetail	Very Wet Sites	12.2	12 • 6
07 Sxw – Devil's club – Ostrich fern	Very Wet Sites	12.2	12 • 6
SBSwk1			
01 Sxw – Oak fern	Wet Sites	12.1	12 • 4
05 Sxw – Huckleberry – Highbush-cranberry	Moist Sites	12.3	12 • 7
06 Sxw – Pink spirea – Oak fern	Wet Sites	12.1	12 • 4
07 Sxw – Twinberry – Oak fern	Wet Sites	12.1	12 • 4
08 Sxw – Devil's club	Wet Sites	12.1	12 • 4
09 Sxw – Horsetail	Very Wet Sites	12.2	12 • 6
10 Sxw – Devil's club – Lady fern	Very Wet Sites	12.2	12 • 6
12 SbPl – Feathermoss	Moist Sites	12.3	12 • 7
ICHvk2			
01 CwHw – Devil's club – Lady fern	Wet Sites	12.1	12 • 4
04 CwHw – Oak fern	Wet Sites	12.1	12 • 4
05 Cw – Devil's club – Ostrich fern	Wet Sites	12.1	12 • 4
06 CwSxw – Skunk cabbage	Very Wet Sites	12.2	12 • 6
ESSFwk1			
01 Bl – Oak fern – Brachythecium	Moist Sites	12.3	12 • 7
03 Bl – Oak fern – Knight's plume	Moist Sites	12.3	12 • 7
04 Bl – Twinberry – Lady fern	Wet Sites	12.1	12 • 4
05 Bl – Devil's club – Lady fern	Wet Sites	12.1	12 • 4
06 Bl – Horsetail – Sphagnum	Very Wet Sites	12.2	12 • 6
07 Bl – Lady fern – Horsetail	Very Wet Sites	12.2	12 • 6

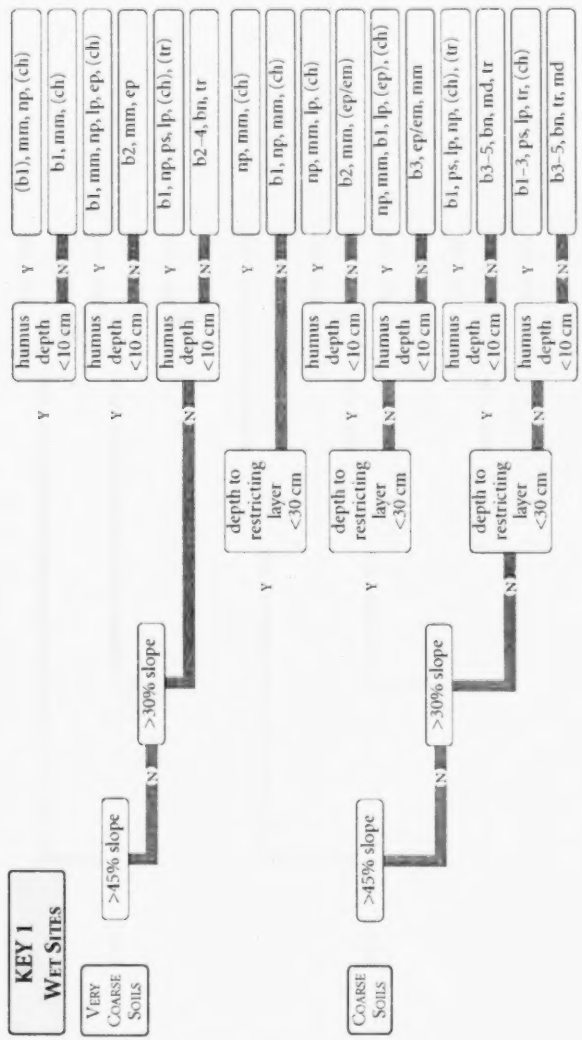
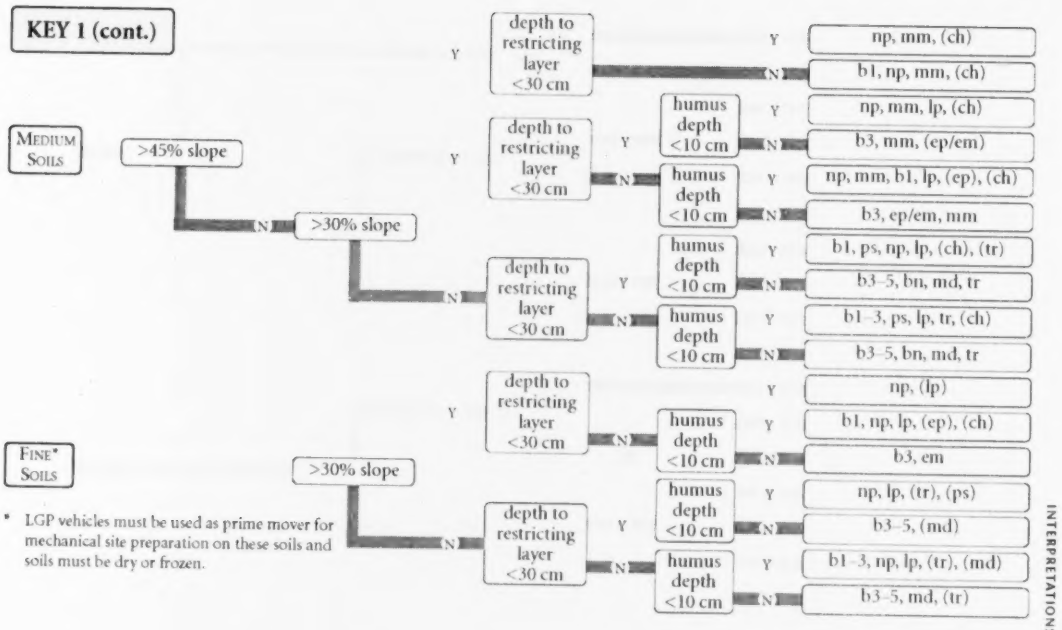


Figure 12.1 *Site preparation key number 1 (wet sites).*



* LGP vehicles must be used as prime mover for mechanical site preparation on these soils and soils must be dry or frozen.

Figure 12.1 *Continued*

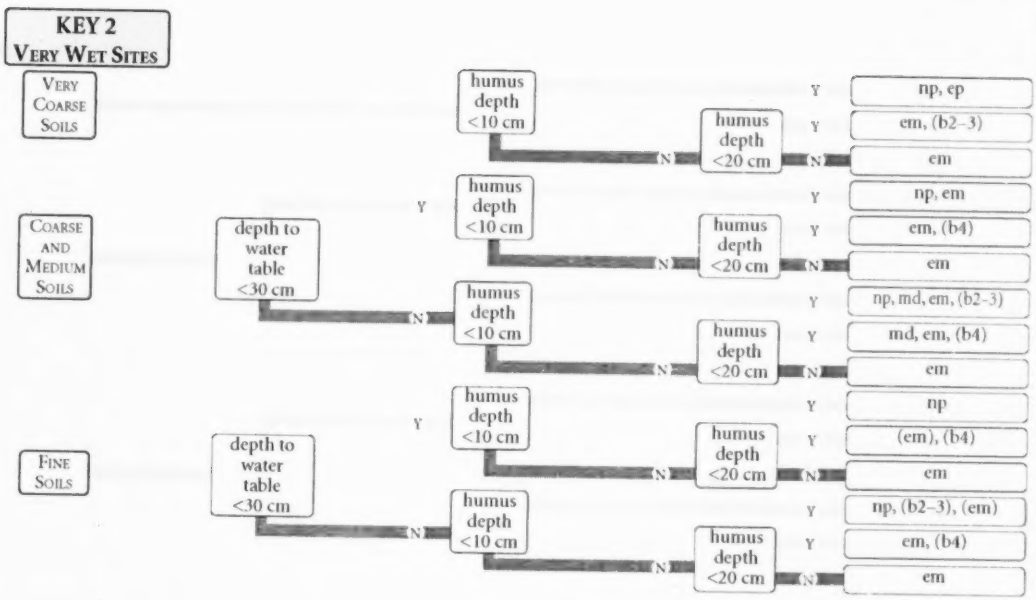
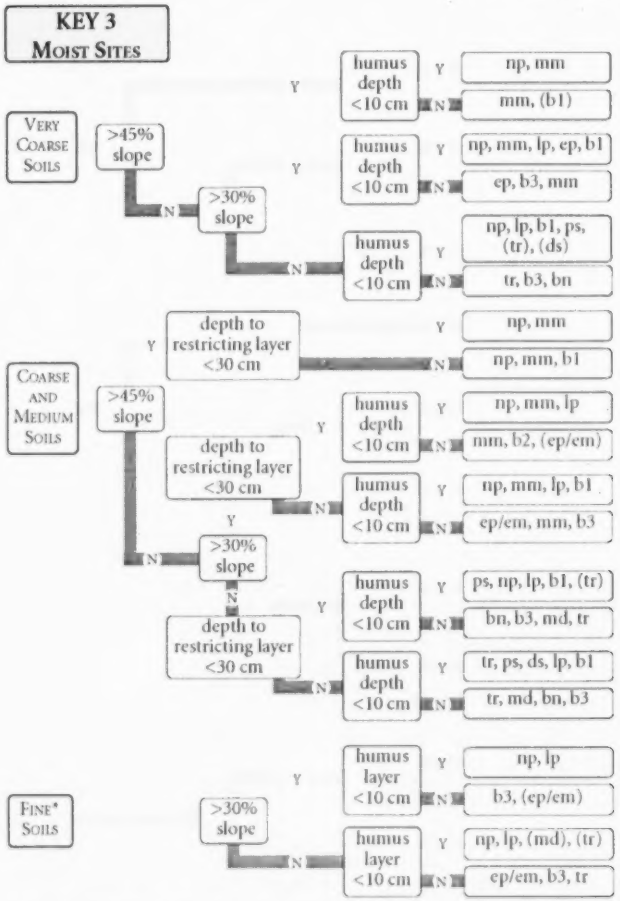


Figure 12.2 *Site preparation key number 2 (very wet sites).*



* LGP vehicles must be used as prime mover for mechanical site preparation on these soils and soils must be dry or frozen.

Figure 12.3 *Site preparation key number 3 (moist sites).*

Site preparation codes

np: **No Site Preparation** – this option requires that slash reduction and alignment of slash become important components of the harvesting prescription (see Section 12.1.1). If brush hazard is high to extreme (see individual site unit interpretations), large sturdy stock should be planted in planter-prepared screefs. Areas receiving no site preparation should be monitored carefully to assess the need for brushing and weeding.

bn: **Brushblading Normal** – this technique includes all equipment capable of blading on sites up to 30% slope. The intent of this treatment is to pile slash and remove a portion of the organic layer without removing mineral soil. Increasingly complex microtopography makes this treatment more difficult to perform. A skilled operator, small equipment, and close supervision are required for this treatment to be effective without damaging the site.

b#: **Broadcast Burning** – broadcast burning has been separated into severity classes based on Trowbridge et al. (1989) (Table 12.3). Operational experience will be needed to meet the objectives stated in the tables. When prescribing a broadcast burn it is important to consider other units that may be included in the block to be harvested and are more sensitive to burning (e.g., drier units with thinner humus layers or shallow soils). The probable impact of the treatment on these units will need to be determined. If the treatment is felt to be too severe for these other units, try to either exclude them from the block or guard these areas from the burn impact. Broadcast burning will generally stimulate species that regenerate from buried seed (e.g., raspberry, currants, and gooseberries) or rhizomes (e.g., thimbleberry). Brushing and weeding will be required if these types of species are present.

TABLE 12.3 *Fuel consumption for different prescribed burning severity*

	Fuel consumption		
		Slash (%)	
Severity	Duff	<7 cm diameter	>7 cm diameter
1	moss/litter	40	15
2	1 – 2 cm	50	20
3	2 – 5 cm	60 – 70	30
4	5 – 8 cm	80	40
5	8–15 cm	90	50

ch: **Chemical or Biological** – this technique includes biological controls (e.g., sheep) and any type of chemical or biological herbicide control. If prescribing this option, slash reduction and alignment of slash will become important components of the harvesting prescription (see Section 12.1.1). Refer to the Wildlife Interpretation section of this guide (Section 12.2) when using this method so that important browse species for wildlife can be identified. Choose the treatment that best meets wildlife and site preparation objectives.

ds: **Drag Scarification** – drag scarification can be used to prepare sites for planting but is more generally used to enhance natural regeneration of lodgepole pine. It is important to include a cone survey in the prescription when implementing drag scarification for natural regeneration. A lop-and-scatter clause may also need to be included if the harvesting is to be done by feller-bunchers. On sites with moderate or higher brush hazard (see individual site unit interpretations), carefully monitor the site in case brushing and weeding are required.

em: **Excavator Mounding** – this option requires that slash reduction and alignment of slash become components of the harvesting prescription (see Section 12.1.1), or excavators must windrow at time of mounding. As slash loading increases on slopes, the productivity of the excavator decreases. Vegetation growth generally increases with amount of organic matter incorporated in the mound capping. Careful monitoring will determine if brushing and weeding are required on sites with thick organic layers, although this may not be required where mounds are sufficiently large.

ep: **Excavator Patch Scarification** – the intent of this treatment is to remove zero or a very limited amount of mineral soil during treatment. This option requires that slash reduction and alignment of slash become components of the harvesting prescription (see Section 12.1.1), or excavators must windrow at time of patch scarification. As slash loading increases on slopes, the productivity of the excavator decreases.

lp: **Light Piling** – this category includes any equipment capable of placing slash in piles without the use of a blade (e.g., rake with retractable teeth excavator). This equipment should be capable of piling while causing minimal disruption of the upper soil layers, including the humus. There will be minimal effect on competing vegetation and no increase in soil warming using this treatment.

md: **Mounding** – this category includes all site preparation equipment capable of producing well-distributed raised profiles of organic and/or mineral soil. On sites where heavy slash accumulations are expected, alignment of slash will become an important component of the harvesting prescription (see Section 12.1.1).

Vegetation growth generally increases with amount of organic matter incorporated in the mound capping. Careful monitoring will determine if brushing and weeding are required on sites with thick organic layers. Soils that are fine and have blocky structure should not be mounded, unless using some form of mixed mounds. This is especially true on drier sites or in drier biogeoclimatic units.

mm: **Motor Manual** – this category includes brush saws and hand-held spot scarifying equipment. This option requires that slash reduction and alignment of slash become important components of the harvesting prescription (see Section 12.1.1). On sites where potentially competing species are present and will be stimulated by the action of the treatment chosen (e.g., thimbleberry if spot scarifying), plant large sturdy stock.

ps: **Patch Scarification** – this category includes all site preparation equipment capable of producing well-distributed patches of mineral soil for planting. The intent of this treatment is to remove the humus layer and a thin layer of mineral soil from the prepared patch. On sites where heavy slash accumulations are expected, alignment of slash will become an important component of the harvesting prescription (see Section 12.1.1). Patch scarification will generally stimulate species that regenerate from on-site seeding (e.g., fireweed and grasses) or rhizomes (e.g., thimble berry). Brushing and weeding will be required if these types of species are present.

tr: **Trenching** – this category includes all site preparation equipment capable of producing shallow continuous trenches (e.g., disc trencher). Trenches should be made by contouring the slope where slopes are continuously or intermittently >15%. Trenching will generally stimulate species that regenerate from on-site seeding (e.g., fireweed and grasses). Brushing and weeding will be required if these types of species are present. Trees should usually be planted high up on the hinge in the units covered by this guide. Trench depth should never exceed two-thirds of the effective rooting depth on the site (see Table 3.1).

12.1.1 Reducing slash during harvesting

Slash reduction to reduce fire and pest risks and improve planter access is often one of the reasons that site preparation is conducted. On ecologically sensitive sites, however, many site preparation techniques used to reduce slash may also damage the site. Slash can often be reduced during harvesting if the need is identified in the silviculture prescription. Several good references are available on the subject of reducing slash during harvesting. Some of these techniques include slash alignment using feller-bunchers or grapples, increasing utilization, and on-site processing of residue (e.g., chipping). Refer to *Treatment of Logging Residues: Alternatives to Prescribed Burning* (Hedin 1991) and *Alternatives to Prescribed Burning* (Burton [compiler and editor] 1991).

12.2 Wildlife Interpretations

This section is included to provide information on stand and vegetation characteristics important to key wildlife species or species groups. Section 12.2.1 contains information on important habitat characteristics for some major wildlife species. For each ecological grouping, a table provides lists of seral stages, vegetation, and special habitat components important to the species or species groups listed. Within the tables, bold text indicates species or habitat attributes of particular importance, normal type indicates general concern, and bracketed species or habitat components are of lower incidence or concern. To determine which table to use, refer to Table 12.5. Descriptions of the information found in the tables and how it might be applied are outlined in the following text.

Seral Stage(s): these are defined on the basis of several attributes that change over time, including stand age, vegetation physiognomy, stand structure, mortality/replacement relationships, and stand diversity. Figure 12.4 offers a schematic representation of various seral stages. The wildlife tables list which seral stages are important for selected wildlife species. The importance, extent, and distribution of a certain ecological unit/seral stage combination within a management area (e.g., watershed) will assist in determining if the unit should be deferred from harvesting. The following descriptions are intended to assist in the recognition and classification of seral stages.

> **SH: Shrub-herb** – this stage is maintained by environmental conditions or develops after a disturbance in which the forest canopy is completely or significantly removed (e.g., after clearcut logging or a severe fire) and typically lasts up to 15 years, although it may persist much longer. It is dominated by shrubby vegetation; seedlings and advance regeneration may be abundant; tree cover <10%, shrub cover >20% or >33% of total cover. Establishment is

the primary process; biomass increases rapidly and floristic diversity is often high.

PS: Pole-sapling – this stage typically begins about 5–15 years after a disturbance, when the young trees overtop the shrubby or herbaceous vegetation. It is dominated by trees >10 m tall, typically densely stocked that have overtopped shrub and herb layers. Younger stands are vigorous (usually >10–15 years old) but older stagnated stands (up to 100 years old) are also included. Self-thinning and vertical structure are not yet evident in the canopy. This often occurs by age 30 in vigorous broadleaf stands, which are generally younger than coniferous stands at the same structural stage. Time since disturbance <40 years for normal forest succession; up to 100+ years for dense (5000–15000+ stems per ha) stands. Stands are more or less even-aged, having been planted or established naturally within a relatively short time. Establishment remains the dominant process with stand biomass continuing to increase. Understorey biomass declines as the canopy closes in.

YF: Young Forest – this stage begins when self-thinning becomes evident and the forest canopy has begun to differentiate into distinct layers (dominant, main canopy, and overtopped). A second cycle of trees begin to show a significant presence in the ground layer by the end of this stage. Self-thinning, low stand diversity, and increasing biomass through rapid height growth are characteristic of this stage. Understorey development is often limited by the dense forest canopy. In open forests where self-thinning may not be evident and a second cycle of trees is lacking, this stage will be characterized more by the vigorous growth of the trees. This stage begins as early as age 30 and extends to 50–80 years; time since disturbance is generally 40–80 years, depending on tree species and ecological conditions.

MF: Mature Forest – this stage extends until the trees established after the last disturbance mature, height growth slows, and some of the initial trees begin to die. A second cycle of trees may show a significant presence in the lower tree layers. In some cases the first cycle of trees may begin to die from old age before significant development of a replacement layer begins; in other cases the next cycle of trees may be well developed before significant mortality of the initial cohort occurs. Generally, the even age distribution typical of early stages changes as new trees become established and older trees begin to die. Gap phase replacement may begin to be important at this stage. The understorey generally becomes well developed as the canopy opens. Time since disturbance generally 80–140 years.

OG: Old-growth – old-growth stands are generally structurally complex stands comprised mainly of shade-tolerant and

regenerating tree species, although older seral and long-lived trees from a disturbance such as fire may still dominate the upper canopy. Stands show structural heterogeneity as gaps develop in the canopy after trees fall. The understorey biomass increases as light becomes available. The presence of dead wildlife trees and rotting logs in all stages of decomposition scattered on the forest floor enhances the value of forests at this seral stage for wildlife. This stage often begins about 140 years after a succession-initiating disturbance.

Vegetation: this column within the tables indicates the species of vegetation important to the wildlife species listed for the site group. Species presence and utilization is very important information to consider when choosing site preparation and brushing and weeding options. See *A Preliminary Guide to the Response of Major Species of Competing Vegetation to Silvicultural Treatments* (Coates and Haeussler 1986) for information on how some vegetational species are affected by different treatments. In certain cases (e.g., *Bryoria* spp.) the species can only be retained by leaving older trees on the site.

Special Habitat Components: this column within the tables indicates which habitat components are important to the wildlife species being managed for. Many wildlife species are associated with a particular successional stage, usually the shrub-herb or the mature seral-old-growth stages. Timber management practices emphasize the pole-sapling and young forest stages, which are generally the least valuable for wildlife and have the lowest species diversity. However, management at the stand level can maintain some of the most important features of shrub-herb and old-growth forests, thereby increasing the stand's value to wildlife throughout the rotation. The habitat components included in the table are described in the following commentary.

WT: Wildlife Trees – otherwise known as snags, these are important for cavity dwellers such as woodpeckers, common and Barrow's goldeneye, marten, and fisher. They also provide perching sites for owls and raptors and foraging substrates for insectivorous birds. Small wildlife trees are used only by small species; pileated woodpeckers, which excavate the larger cavities used by ducks and fisher, require wildlife trees of at least 26 cm dbh and preferably 40 cm.

CWD: Coarse Woody Debris – this includes sound and rotting logs and stumps and provides cover for small mammals and their predators. It is widely used by invertebrates and hence as a foraging substrate by insectivorous birds. CWD provides nesting and denning sites for birds and larger mammals and can be important in courtship rituals. It supplies a sheltered environment for reptiles and amphibians that cannot tolerate extremes of

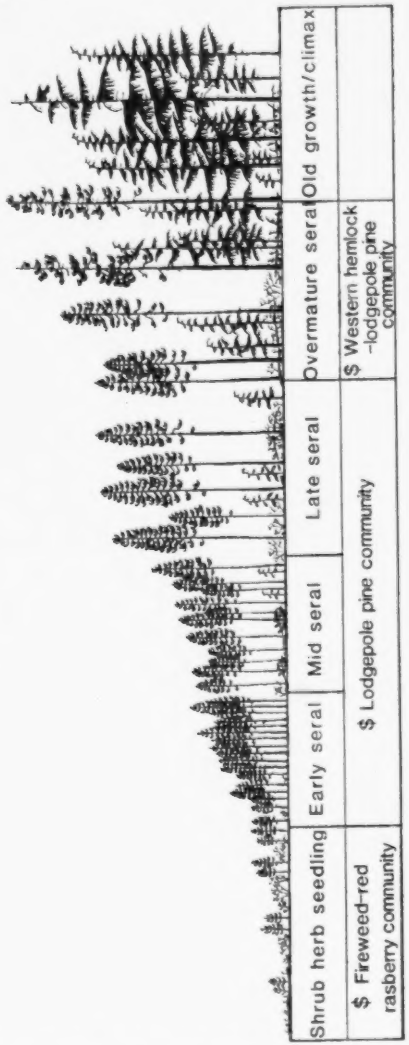


FIGURE 12.4 *Example of forest structure associated with seral stages.*

temperature or drought. CWD also provides subnivean access routes that are particularly important for marten. Wildlife trees and CWD have a limited lifespan, depending on their size and degree of decomposition. Also, isolated wildlife trees are of limited value to wildlife. A preferred option would be to leave groups of wildlife trees with some large green trees (future wildlife trees), possibly where harvesting would be difficult or uneconomical. Wildlife trees and CWD are vulnerable to destruction by prescribed fire. However, large diameter wood is generally only charred, especially if fire is used in spring or after heavy rain when fine fuels have dried out but larger fuels have not. Although charred logs are made more durable by fire hardening, they also become less valuable to wildlife in the short term as loose bark is removed and they are made too hard to be used by wood-boring insects or by cavity-excavating birds.

DT: Deciduous Trees – this component is important to songbirds such as warblers, vireos, and flycatchers as foraging and nesting areas. Many primary cavity nesters prefer aspen and cottonwood to conifers, probably because cavity excavation is easier. Living and dead cottonwood trees are particularly important because of their large size.

SP: Slash/Brush Piles – this structural feature provides snow interception and cover for small birds and mammals. Because this is such an important structural attribute for voles, predators such as marten, fox, coyote, and weasels will also benefit. Leaving small slash piles unburned could increase populations of voles and porcupines.

ED: Edges – these occur between vegetation types (such as mature timber-clearcut or forested wetland-mesic forest) and are important for species that use either area. Species using both areas often prefer the juxtaposition of habitat types. Edges also provide habitat for species that prefer the transition zone (ecotone) between them. Edge can be created by dispersing smaller clearcuts or by having larger blocks with irregular edges and dispersed wildlife tree patches within the block. The second option is preferred as it reduces fragmentation and active road density.

SA: South Aspects – this feature, because of increased solar radiation, is associated with reduced snow accumulation. This favours species such as mule deer that do not tolerate deep snow. These areas are among the first sites to provide spring forage.

SU: Spring Use – occurs on those sites that provide important early season foraging opportunities. As such, it is closely related to southerly aspect and early disappearance of snow cover. These areas are important for hibernating species and for those that do not tolerate deep snow.

SL: Shelter – provides thermal and hiding cover for all wildlife species. It is particularly important for big game species during hunting and calving seasons. In winter, tree canopies intercept snowfall and minimize the energy expended in movement.

LGS: Low-Gradient Streams – as one component of riparian habitats, these areas are extremely important for fish and wildlife. These areas provide a water source for many organisms and create a more moderate microclimate than is found in more upland forests. Streams may also function as corridors that facilitate genetic interchange, daily and seasonal movements, and range extension. Beaver prefer streams with gradients <6%.

WE: Wetlands – these areas are found adjacent to the normal high water line around lakes, ponds, rivers, and streams. These habitats provide abundant vegetation for forage and cover, horizontal and vertical diversity, large invertebrate populations, water sources for drinking, and a more stable microclimate than the surrounding upland forests. Because of their high productivity, many wildlife species reach their highest densities in riparian habitats, especially in those adjacent to old-growth forests.

12.2.1 Habitat characteristics for species of management concern

Grizzly bear – early seral stages provide berries, especially huckleberries, blueberries, soapberries, and raspberries. Grizzly bears must have a variety of berry-bearing shrubs so that fruit is available throughout the summer. Protein-rich succulent herbs (horsetail, sedges, cow parsnip) in riparian and seepage areas are particularly important in spring. Where significant concentrations of spawning fish (e.g., salmon, bull trout, Kokanee) occur, they provide an important protein supplement. Grizzly bears feed on ants in stumps and CWD. On the plateau they den under the roots of large, old trees.

Beaver – uses aspen/willow shrubs <10 cm dbh, near water; also riparian herbs in spring; preferred stream gradient is <6%.

Red squirrel – population fluctuates with cone crop, primarily spruce; uses groups of large conifers for nesting, coarse woody debris for food cache.

Coyote – uses mostly early seral stages through young forest; often associated with edges/ecotones.

Gray wolf – depends on prey (beaver-sized or larger); no particular habitat requirements.

Red fox – uses mostly early seral stages through young forest; often associated with edges/ecotones.

Cougar – depends on ungulate (chiefly deer) prey; no particular habitat requirements.

Lynx – dependent on snowshoe hare (found chiefly in shrubby stands or overstocked pine plantations 15–25 years old); den in blowdown in old-growth.

Wolverine – dependent on ungulate carrion; no particular habitat requirements although generally prefers upland coniferous forest; does not tolerate disturbance.

River otter – aquatic and riparian; often associated with beaver activity; uses logjams, coarse woody debris, and dense riparian shrubs and herbs.

Marten – uses mature forest and old-growth, most common in productive forest with large down logs; highly dependent on coarse woody debris. Wildlife trees and brush piles are also used as den sites and access routes to subnivean hunting grounds.

Fisher – uses pole-sapling and young mixed forest in summer, mature forest and old-growth in winter, possibly for snow interception; requires >50% crown closure; natal dens in large tree cavities; also uses coarse woody debris, slash piles, and edges/ecotones.

Striped skunk – opportunistic omnivore; prefers open forest and forest edge.

Ermine – dependent on small mammals, chiefly voles; most common in early seral stages.

Long-tailed weasel – dependent on small mammals, chiefly voles, but also takes hares; most common in fairly early seral stages.

Least weasel – hunts mostly small voles and mice; prefers open areas, especially aspen parkland.

Mink – wetlands, riparian; dependent on emergent vegetation and riparian thickets; also uses brush piles, coarse woody debris, logjams.

Black bear – uses wetland and seepage areas for grasses and sedges in early spring; early seral stages for berries in summer, especially raspberries, huckleberries, strawberries, saskatoon; dens under tree roots, fallen logs, slash piles, rock crevices.

Moose – uses wetland edges and areas of dense cover in summer; requires adequate densities of browse plants, chiefly willow and red-osier dogwood, in areas of reduced snow accumulation in winter. May move to mature or old-growth forest for protection from cold stress and in late winter for snow interception. Young aspen bark is important in spring.

Woodland caribou – dependent on arboreal lichens in old-growth trees for winter forage throughout most of the guide area. Uses mostly high elevation forests (>1600 m) in late winter, but uses mid-elevation (1300–1600 m) subalpine fir and spruce forests in November and December. In the northern portions of the SBSwk1, dry pine-lichen forests are used November through February.

Mule deer – old-growth coniferous forests, especially Douglas-fir forests on southerly aspects, with arboreal lichen are important habitats in winter.

TABLE 12.4 *Bird species groups considered in the wildlife tables*

Species group	Description	Representative species
A	primary cavity-nesters, mainly in conifers	black-backed woodpecker, three-toed woodpecker
B	primary cavity-nesters, mainly in deciduous trees or wildlife trees	red-breasted sapsucker, northern flicker, downy woodpecker, hairy woodpecker, pileated woodpecker
C	secondary cavity-nesters	Barrow's goldeneye, common goldeneye, bufflehead, hooded merganser, common merganser, northern hawk owl, boreal owl, northern saw-whet owl, Vaux's swift, many passerines; also bats
D	ground-nesters near water	eared grebe, Canada goose, green-winged teal, mallard, northern pintail, blue-winged teal, cinnamon teal, American wigeon, ring-necked duck, lesser scaup, white-winged scoter
E	deciduous tree and thicket dwellers	warblers, vireos, flycatchers, thrushes; other migrating passerines
F	mature coniferous forest dwellers	northern goshawk, red-breasted nuthatch, brown creeper, Townsend's warbler, red crossbill

TABLE 12.5 *Table and page numbers for wildlife tables by site series*

Site series	Table number	Page number
SBSdw1		
01 SxwFd – Pinegrass	12.8	12 • 23
02 FdPl – Cladonia	12.7	12 • 22
03 Fd – Saskatoon – Pinegrass	12.7	12 • 22
04 Pl – Pinegrass – Feathermoss	12.6	12 • 21
05 SxwFd – Ricegrass	12.8	12 • 23
06 SxwFd – Thimbleberry	12.9	12 • 24
07 Sxw – Twinberry – Coltsfoot	12.9	12 • 24
08 Sxw – Twinberry – Oak fern	12.10	12 • 26
09 Sxw – Horsetail – Glow moss	12.11	12 • 28
SBSmh		
01 SxwFd – Hazelnut	12.9	12 • 24
02 FdPl – Cladonia	12.7	12 • 22
03 FdPl – Velvet-leaved blueberry – Cladonia	12.7	12 • 22
04 Fd – Douglas maple – Step moss	12.5	
05 SxwFd – Feathermoss	12.9	12 • 24
06 SxwFd – Coltsfoot	12.9	12 • 24
07 SxwEp – Devil's club	12.10	12 • 26
08 Sxw – Ostrich fern	12.11	12 • 28
09 Sxw – Horsetail – Glow moss	12.11	12 • 28
SBSmw		
01 SxwFd – Falsebox	12.8	12 • 23
02 FdBl – Huckleberry	12.6	12 • 21
03 Pl – Huckleberry – Velvet-leaved blueberry	12.6	12 • 21
04 SxwFd – Knight's plume	12.8	12 • 23
05 Sxw – Pink spirea	12.10	12 • 26
06 Sxw – Oak fern	12.10	12 • 26
07 Sxw – Twinberry – Oak fern	12.10	12 • 26
08 Sxw – Devil's club	12.10	12 • 26
09 Sxw – Horsetail	12.11	12 • 28
10 SbSxw – Scrub birch – Sedge	12.13	12 • 31
SBSvk		
01 Sxw – Devil's club	12.10	12 • 26
02 Pl – Huckleberry – Velvet-leaved blueberry	12.6	12 • 21
03 SxwFd – Thimbleberry	12.9	12 • 24
04 Sxw – Oak fern	12.10	12 • 26
05 Sxw – Devil's club – Spiny wood fern	12.10	12 • 26
06 Sxw – Horsetail	12.11	12 • 28
07 Sxw – Devil's club – Ostrich fern	12.10	12 • 26
08 SbPl – Bog-laurel – Sphagnum	12.13	12 • 31
09 Pl – Huckleberry – Cladina	12.6	12 • 21
10 Sxw – Skunk Cabbage	12.11	12 • 28

TABLE 12.5 *Continued*

Site series	Table number	Page number
SBSwk1		
01 Sxw – Oak fern	12.10	12 • 26
02 Pl – Huckleberry – Cladina	12.6	12 • 21
03 Pl – Huckleberry – Velvet-leaved blueberry	12.6	12 • 21
04 SxwFd – Knight's plume	12.8	12 • 23
05 Sxw – Huckleberry – Highbush-cranberry	12.9	12 • 24
06 Sxw – Pink spirea – Oak fern	12.10	12 • 26
07 Sxw – Twinberry – Oak fern	12.10	12 • 26
08 Sxw – Devil's club	12.10	12 • 26
09 Sxw – Horsetail	12.11	12 • 28
10 Sxw – Devil's club – Lady fern	12.10	12 • 26
11 SbSxw – Scrub birch – Sedge	12.13	12 • 31
12 SbPl – Feathermoss	12.9	12 • 24
ICHvk2		
01 CwHw – Devil's club – Lady fern	12.10	12 • 26
02 HwCw – Cladonia	12.6	12 • 21
03 HwCw – Step moss	12.9	12 • 24
04 CwHw – Oak fern	12.10	12 • 26
05 Cw – Devil's club – Ostrich fern	12.11	12 • 28
06 CwSxw – Skunk cabbage	12.11	12 • 28
07 Sb – Sphagnum	12.13	12 • 31
ESSFwk1		
01 Bl – Oak fern – Brachythecium	12.12	12 • 30
02 Bl – Huckleberry – Feathermoss	12.12	12 • 30
03 Bl – Oak fern – Knight's plume	12.12	12 • 30
04 Bl – Twinberry – Lady fern	12.12	12 • 30
05 Bl – Devil's club – Lady fern	12.12	12 • 30
06 Bl – Horsetail – Sphagnum	12.12	12 • 30
07 Bl – Lady fern – Horsetail	12.12	12 • 30
08 Scrub birch – Sedge – Sphagnum	12.13	12 • 31

Note: Tables 12.6 to 12.13

Within the tables, bold text indicates species or habitat attributes of particular importance, normal type indicates general concern, and bracketed species or habitat components are of lower incidence or concern.

TABLE 12.6 *Information for wildlife species of management concern for* ***dry lodgepole pine and western hemlock*** *site units*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
(grizzly bear)	SH MF OG (PS YF)	*Rosa acicularis, Shepherdia canadensis, Vaccinium myrtilloides, Arctostaphylos uva-ursi, Calamagrostis rubescens*	CWD, SU, SA
(black bear)	(ALL)	*Rosa acicularis, Shepherdia canadensis, Vaccinium myrtilloides, Arctostaphylos uva-ursi, Calamagrostis rubescens*	SU, SA, ED
caribou	MF (OG YF)	*Alectoria* spp., *Bryoria* spp., *Cladina* spp., *Cladonia* spp.	
(moose)	MF OG (SH)	*Abies lasiocarpa, Amelanchier alnifolia, Rosa acicularis, Vaccinium myrtilloides, Epilobium angustifolium*	SL, ED, DT
(mule deer)	SH MF OG	*Amelanchier alnifolia, Populus tremuloides, Alectoria* spp., *Bryoria* spp.	SL, ED
(gray wolf)	(ALL)		
coyote	ALL		SP, ED
(red fox)	SH PS		ED, SP
lynx	SH PS YF of Pl		CWD, SP
ermine	SH (ALL)		SP, CWD
red squirrel	(PS) YF MF OG		WT, CWD
chipmunks	ALL		CWD, SP
voles/mice	ALL		CWD, SP
snowshoe hare	PS YF (SH MF)		SP, CWD
(porcupine)	PS YF		SP
(Group B)	MF, OG		WT, DT
(Group C)	MF, OG		WT, DT
(Group E)	ALL		DT, CWD
Group F	ALL		DT

[a] SH – shrub-herb, PS – pole-sapling, YF – young forest, MF – mature forest, OG – old-growth.
[b] OH – open habitats, SU – spring use, SA – south aspect, ED – edges, SP – slash/brush piles, CWD – coarse woody debris, SL – shelter, DT – deciduous trees, WT – wildlife trees.

TABLE 12.7 *Information for wildlife species of management concern for* ***dry Douglas-fir*** *site units*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
black bear	ALL	*Abies lasiocarpa*, *Rosa acicularis*, *Shepherdia canadensis*, *Vaccinium myrtilloides*, *Calamagrostis rubescens*	SU, SA, ED
(moose)	ALL	*Amelanchier alnifolia*, *Populus tremuloides*, *Pseudostuga menziesii*	SL, ED, DT
mule deer	ALL	*Amelanchier alnifolia*, *Rosa acicularis*, *Calamagrostis rubescens*, *Festuca* spp., *Oryzopsis* spp.	SA, ED
cougar	(ALL)		
(gray wolf)	(ALL)		
coyote	ALL		SP, ED
red fox	ALL		ED, SP
(lynx)	PS		CWD, SP
(fisher)			CWD
(marten)	MF OG		CWD, WT, SP
ermine	ALL		SP, CWD
red squirrel	MF OG		WT, CWD
	(PS YF)		
chipmunk	ALL		CWD, SP
voles/mice	SH OG		
	(PS YF MF)		CWD, SP
(snowshoe hare)	PS (YF)		SP, CWD
(porcupine)	ALL		SP
Group A	MF OG		WT, DT
Group B	MF OG		WT, DT
Group C	MF OG		WT, DT
(Group E)	(ALL)		DT, CWD
Group F	MF OG		DT

[a] SH – shrub-herb, PS – pole-sapling, YF – young forest, MF – mature forest, OG – old-growth.
[b] SU – spring use, SA – south aspect, ED – edges, SP – slash/brush piles, CWD – coarse woody debris, WT – wildlife trees, SL – shelter, DT – deciduous trees.

TABLE 12.8 *Information for wildlife species of management concern for* ***moist Douglas-fir*** *site units*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
grizzly bear	SH MF OG (PS YF)	*Amelanchier alnifolia, Rosa acicularis, Rubus parviflorus, Vaccinium membranaceum, Calamagrostis rubescens*	CWD, SA
black bear	ALL	*Amelanchier alnifolia, Rosa acicularis, Rubus parviflorus, Vaccinium membranaceum, Calamagrostis rubescens*	SA, ED
moose	SH PS MF OG (YF)	*Abies lasiocarpa, Amelanchier alnifolia, Populus tremuloides, Rosa acicularis, Epilobium angustifolium*	SL, ED, DT
mule deer	SH OG PS MF (YF)	*Acer glabrum, Abies lasiocarpa, Paxistima myrsinites, Pseudostuga menziesii, Rosa acicularis*	SA, ED
cougar	ALL		
gray wolf	(ALL)		
coyote	ALL		SP, ED
red fox	ALL		ED, SP
(lynx)	ALL		CWD, SP
ermine	SH (ALL)		SP, CWD
red squirrel	MF OG		
	PS YF		WT, CWD
chipmunks	ALL (PS YF)		CWD, SP
voles/mice	ALL (PS YF)		CWD, SP
(snowshoe hare)	PS YF		
	(SH MF)		SP, CWD
porcupine	PS YF MF		SP
Group A	MF OG		WT, DT
Group B	MF OG		WT, DT
Group C	MF OG		WT, DT
(Group D)			CWD
Group E	ALL	*Viburnum edule*	DT, CWD
Group F	MF OG		DT

[a] SH – shrub-herb, PS – pole-sapling, YF – young forest, MF – mature forest, OG – old-growth.

[b] SU – spring use, SA – south aspect, ED – edges, SP – slash/brush piles, CWD – coarse woody debris, SL – shelter, DT – deciduous trees, WT – wildlife trees.

TABLE 12.9 *Information for wildlife species of management concern for* ***moist hybrid white spruce and western hemlock*** *site units*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
grizzly bear	ALL	*Lonicera involucrata, Rubus parviflorus, Shepherdia canadensis, Vaccinium membranaceum, Viburnum edule, Epilobium angustifolium*	CWD
black bear	ALL	*Lonicera involucrata, Rubus parviflorus, Shepherdia canadensis, Vaccinium membranaceum, Viburnum edule, Epilobium angustifolium*	ED
moose	SH PS MF OG (YF)	*Abies lasiocarpa, Acer glabrum, Populus* spp., *Rubus parviflorus, Salix* spp., *Vaccinium membranaceum, Viburnum edule, Epilobium angustifolium*	SL, ED, DT
(mule deer)	(ALL)	*Cornus stolonifera, Rosa acicularis, Pseudostuga menziesii, Alectoria* spp., *Bryoria* spp.	SL, ED
gray wolf	(ALL)		
coyote	SH PS		SP, ED
red fox	SH PS		ED, SP
lynx	SH PS (YF MF OG)		CWD, SP
(wolverine)	(ALL)		
(fisher)	PS YF MF OG		CWD, DT
marten	MF OG (SH)		CWD, WT, SP, ED
ermine	SH PS OG		SP, CWD
(beaver)	SH PS YF	*Populus* spp., *Salix* spp.	LGS, WE, DT
red squirrel	PS YF MF OG		WT, CWD
voles/mice	SH OG		CWD, WT, SP
red-backed vole	(PS YF MF)		

TABLE 12.9 *Continued*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
snowshoe hare	PS YF (SH MF OG)		SP, CWD
porcupine	(PS YF MF)		SP
Group A	MF OG (YF)		WT, DT
Group B	OG YF MF		WT, DT
Group C	OG MF		WT, DT
(Group D)	MF OG		CWD
Group E	ALL	*Vaccinium membranaceum*	DT, CWD
Group F	MF OG		DT

[a] SH – shrub-herb, PS – pole-sapling, YF – young forest, MF – mature forest, OG – old-growth.

[b] LGS – low gradient streams, WE – wetlands, DT – deciduous trees, SU – spring use, SA – south aspect, ED – edges, SP – slash/brush piles, CWD – coarse woody debris, WT – wildlife trees, SL – shelter.

TABLE 12.10 *Information for wildlife species of management concern for* ***wet hybrid white spruce and western redcedar*** *site units*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
grizzly bear	SH MF OG (PS YF)	*Cornus stolonifera*, *Lonicera involucrata*, *Ribes lacustre*, *Vaccinium* spp., *Viburnum edule*, *Athyrium filix-femina*, *Epilobium angustifolium*, *Streptopus amplexifolius*	CWD
black bear	SH MF OG (PS YF)	*Cornus stolonifera*, *Lonicera involucrata*, *Ribes lacustre*, *Vaccinium* spp., *Viburnum edule*, *Athyrium filix-femina*, *Epilobium angustifolium*, *Streptopus amplexifolius*	ED
moose	SH PS MF OG (YF)	*Abies lasiocarpa*, *Cornus stolonifera*, *Populus* spp., *Ribes* spp., *Salix* spp., *Vaccinium* spp. *Viburnum edule*, *Epilobium angustifolium*	SL, ED, DT
(mule deer)	(ALL)	*Abies lasiocarpa*, *Rosa acicularis*, *Alectoria* spp., *Bryoria* spp.	SL, ED
gray wolf	(ALL)		
coyote	SH		SP, ED
red fox	SH PS		ED, SP
lynx	SH PS OG (YF)		CWD, SP
(wolverine)	(ALL)		
fisher	YF MF OG (PS)		WT, DT, CWD
marten	MF OG (SH)		CWD, WT, SP, ED
ermine	SH (ALL)		SP, CWD
beaver	SH PS YF	*Populus* spp., *Salix* spp.	LGS, WE, DT
red squirrel	MF OG (PS YF)		WT, CWD
voles/mice			

TABLE 12.10 *Continued*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
red-backed vole	SH OG (PS YF MF)		CWD, WT, SP
snowshoe hare	PS SH (YF OG)		SP, CWD
porcupine	PS YF MF		SP
Group A	MF OG (YF)		WT, DT
Group B	OG YF MF		WT, DT
Group C	OG MF		WT, DT
(Group D)	MF OG		CWD
Group E	SH PS YF MF (OG)		DT, CWD
Group F	MF OG	*Vaccinium* spp.	DT

[a] SH – shrub-herb, PS – pole-sapling, YF – young forest, MF – mature forest, OG – old-growth.

[b] LGS – low-gradient streams, WE – wetlands, DT – deciduous trees, ED – edges, SP – slash/brush piles, CWD – coarse woody debris, WT – wildlife trees, SL – shelter.

TABLE 12.11 *Information for wildlife species of management concern for* ***very wet hybrid white spruce and western redcedar*** *site units*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
grizzly bear	ALL	*Cornus stolonifera*, *Lonicera involucrata*, *Ribes* spp., *Vaccinium* spp., *Viburnum edule*, *Athyrium filix-femina*, *Equisetum* spp., *Heracleum lanatum*, *Streptopus amplexifolius*	CWD
black bear	ALL	*Cornus stolonifera*, *Lonicera involucrata*, *Ribes* spp., *Vaccinium* spp., *Viburnum edule*, *Athyrium filix-femina*, *Equisetum* spp., *Heracleum lanatum*, *Streptopus amplexifolius*	ED
moose	SH OG (PS YF MF)	*Abies lasiocarpa*, *Cornus stolonifera*, *Lonicera involucrata*, *Populus balsamifera*, *Ribes* spp., *Salix* spp., *Viburnum edule*, *Epilobium angustifolium*, *Equisetum* spp., *Urtica dioica*	ED, SL
(mule deer)	(ALL)	*Cornus stolonifera*, *Salix* spp., *Ribes* spp., *Rosa acicularis*	ED, SL
(cougar)	(ALL)		
gray wolf	(ALL)		
coyote	SH PS YF		SP, ED
(red fox)	SH (PS YF)		ED, SP
lynx	SH PS (OG YF)		CWD, SP
(fisher)	PS YF MF OG		WT, CWD, SP, ED, DT
marten	MF OG (SH)		WT, CWD, SP, ED
ermine	SH (ALL)		SP, CWD

TABLE 12.11 *Continued*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
beaver	SH PS YF	*Salix* spp., *Populus* spp.	LGS, WE, DT
red squirrel	MF OG (PS YF)		WT, CWD
voles/mice	SH OG (PS YF MF)		CWD, WT, SP
(snowshoe hare)	PS YF (SH MF OG)		SP, CWD
Group A	MF OG		WT
Group B	MF OG		WT, DT
Group C	MF OG		WT, DT
Group E	SH PS YF MF (OG)	*Ribes* spp., *Viburnum edule*	DT
Group F	MF OG		DT

[a] SH – shrub-herb, PS – pole-sapling, YF – young forest, MF – mature forest, OG – old-growth.

[b] LGS – low-gradient streams, WE – wetlands, DT – deciduous trees, ED – edges, SP – slash/brush piles, CWD – coarse woody debris, WT – wildlife trees, SL – shelter.

TABLE 12.12 *Information for wildlife species of management concern for* ***moist–very wet subalpine fir*** *site units*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
grizzly bear	SH MF OG (PS YF)	*Ribes* spp., *Vaccinium* spp., *Athyrium filix-femina*, *Heracleum lanatum*, *Valeriana sitchensis*	CWD, SA
(black bear)	ALL	*Ribes* spp., *Vaccinium* spp., *Athyrium filix-femina*, *Heracleum lanatum*, *Valeriana sitchensis*	ED, SA
caribou	MF OG	*Alectoria* spp., *Bryoria* spp.	
moose	SH MF OG (PS YF)	*Vaccinium* spp., *Carex* spp.	
Forbs	SL, ED		
gray wolf	(ALL)		
(coyote)	SH		SP, ED
(lynx)	(ALL)		CWD, SP
marten	MF OG (SH)		WT, SP, CWD, ED
ermine	SH (ALL)		SP, CWD
red squirrel	MF OG (PS YF)		WT, CWD
voles/mice	SH OG		CWD, SP, WT
red-backed vole	(PS YF MF)		
(snowshoe hare)	PS YF (SH MF OG)		SP, CWD
(Group A)	MF OG		WT
(Group C)	MF OG		WT, DT
Group E	SH PS YF	*Ribes* spp., *Viburnum edule*	DT
Group F	MF OG		DT

[a] SH – shrub-herb, PS – pole-sapling, YF – young forest, MF – mature forest, OG – old-growth.
[b] ED – edges, SA – south aspect, SP – slash/brush piles, CWD – coarse woody debris, WT – wildlife trees, SL – shelter, DT – deciduous trees.

TABLE 12.13 *Information for wildlife species of management concern for* ***very wet black spruce*** *site units*

Species	Successional stage[a]	Important forage species	Special habitat components[b]
grizzly bear	SH MF OG (PS YF)	*Carex* spp., *Equisetum* spp., grasses	CWD, SU
black bear	(ALL)	*Carex* spp., *Equisetum* spp., grasses	SU, ED
moose	ALL SH OG	*Betula glandulosa*, *Lonicera involucrata*, *Salix* spp.	SL, ED, DT
(mule deer)	(ALL) SH OG		SL, ED
gray wolf	(ALL)		
coyote	SH		SP, ED
lynx	SH PS YF		CWD, SP
(wolverine)	(ALL)		
(fisher)	PS YF MF OG		SP, WT, CWD, ED, DT
(marten)	MF OG		WT, CWD, SP
mink	(ALL)		CWD, SP
ermine	SH (ALL)		SP, CWD
(beaver)	SH PS YF	*Betula glandulosa*, *Salix* spp.	DT
(red squirrel)	MF OG PS YF		WT, CWD
voles/mice	(ALL) SH OG	*Lonicera involucrata*, *Viburnum edule*	CWD, SP
chipmunks	ALL		CWD, SP
(snowshoe hare)	PS YF (SH MF OG)		SP, CWD
porcupine	(PS YF MF)		SP
(Group D)	SH YF MF OG		ED
(Group E)	ALL		DT, CWD, SP
(Group F)	MF OG		DT, WT

[a] SH – shrub-herb, PS – pole-sapling, YF – young forest, MF – mature forest, OG – old-growth.

[b] SU – spring use, DT – deciduous trees, ED – edges, SP – slash/brush piles, CWD – coarse woody debris, WT – wildlife trees, SL – shelter.

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